FOOD MANUFACTURE

Incorporating Food Industries Weekly

A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP SEPTEMBER 1, 1957

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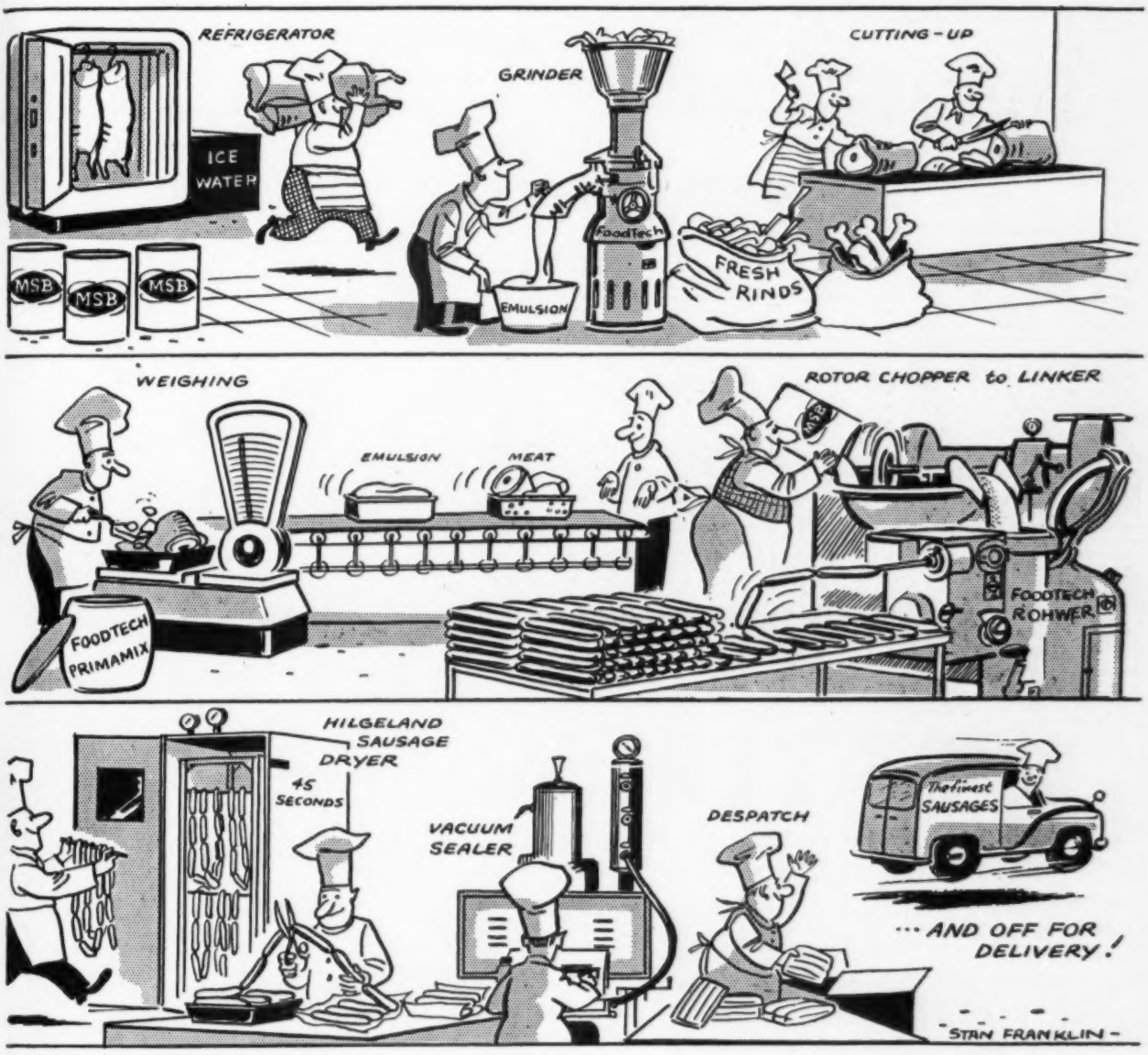

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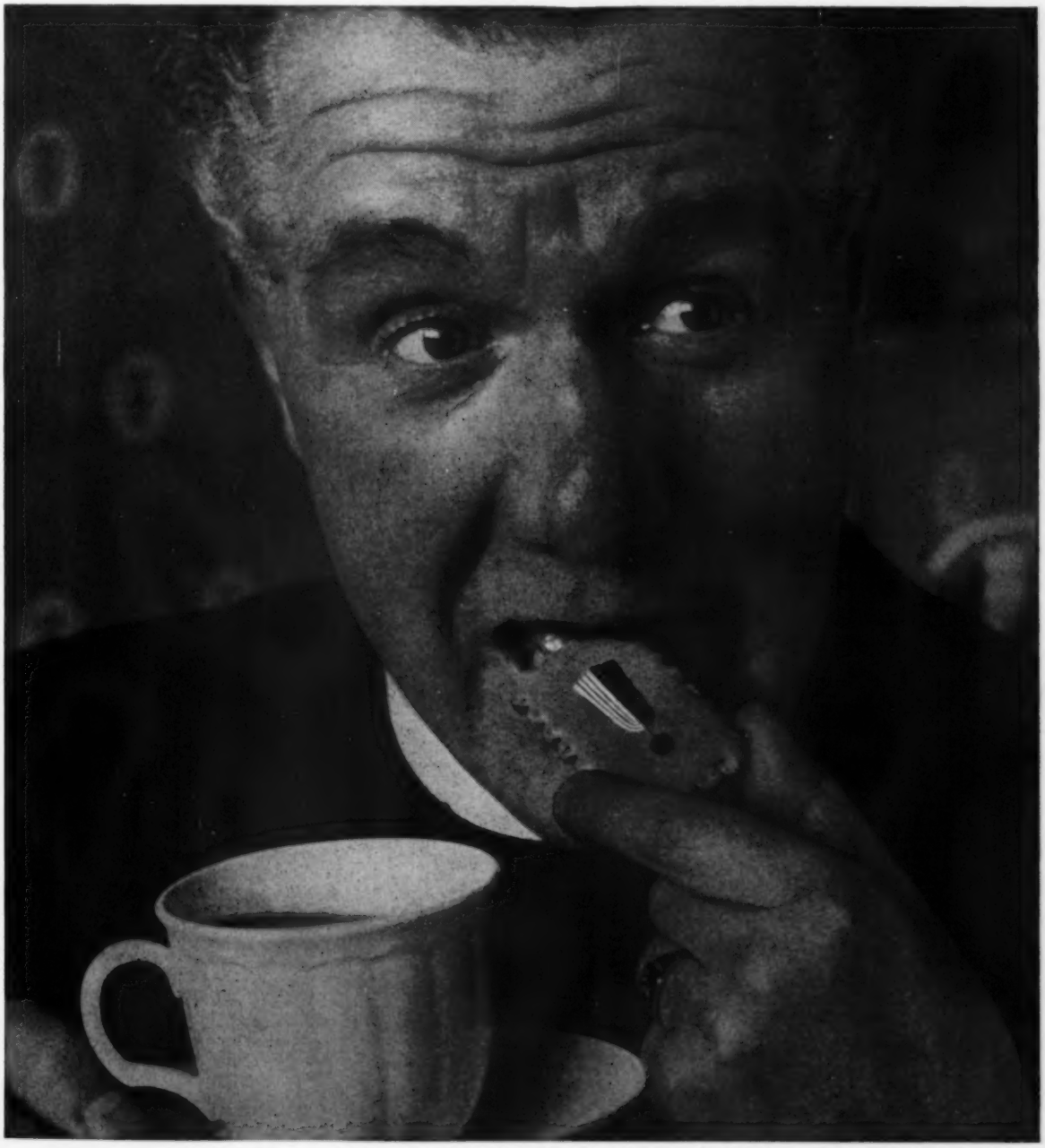

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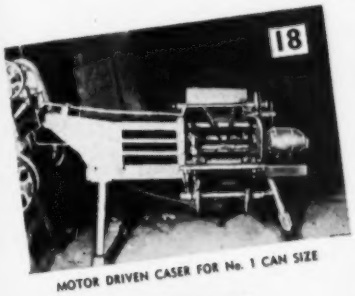

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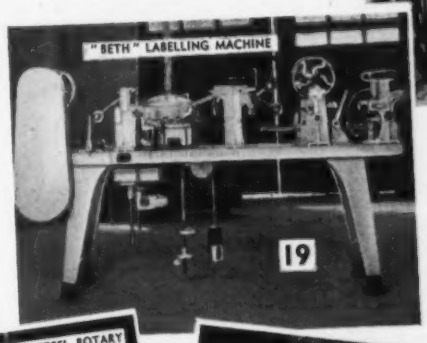

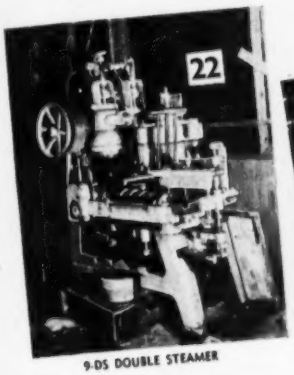

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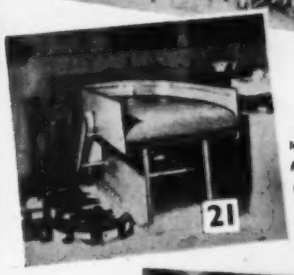

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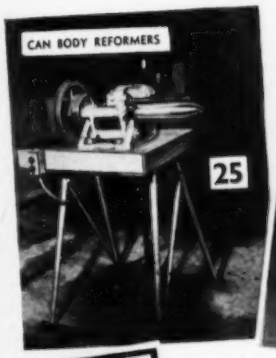
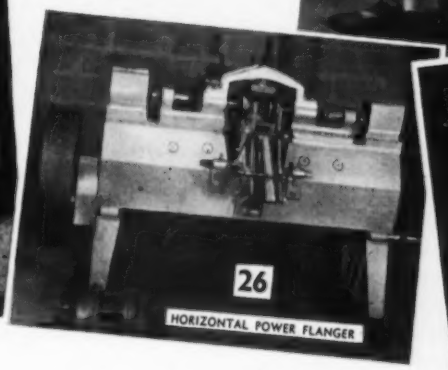
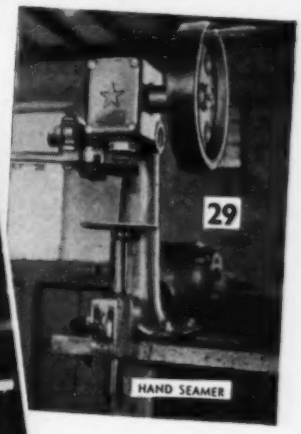
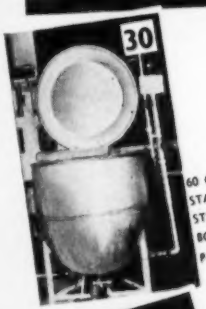
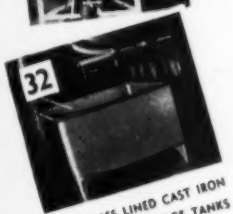








60 GALLON STAINLESS STEEL BOILING PAN



GLASS LINED CAST IRON STORAGE TANKS

All items are in first-class condition and can be seen in the London W.1 Area. In addition to those illustrated the following items are available: Hand Can Flange Rectifier, Motorised Can Elevator, Sanitary Pump, Coconut Shredding Machine, Sausage Filling Machine, Rotary Bowl Chopper, Conveyor, Meat Mincer, Pineapple Grater, 60-gallon Boiling Pan, Pump, Scales, Tape and Sealing Machines, Strapping Machines, etc. For full details see Classified Section, page cxix.

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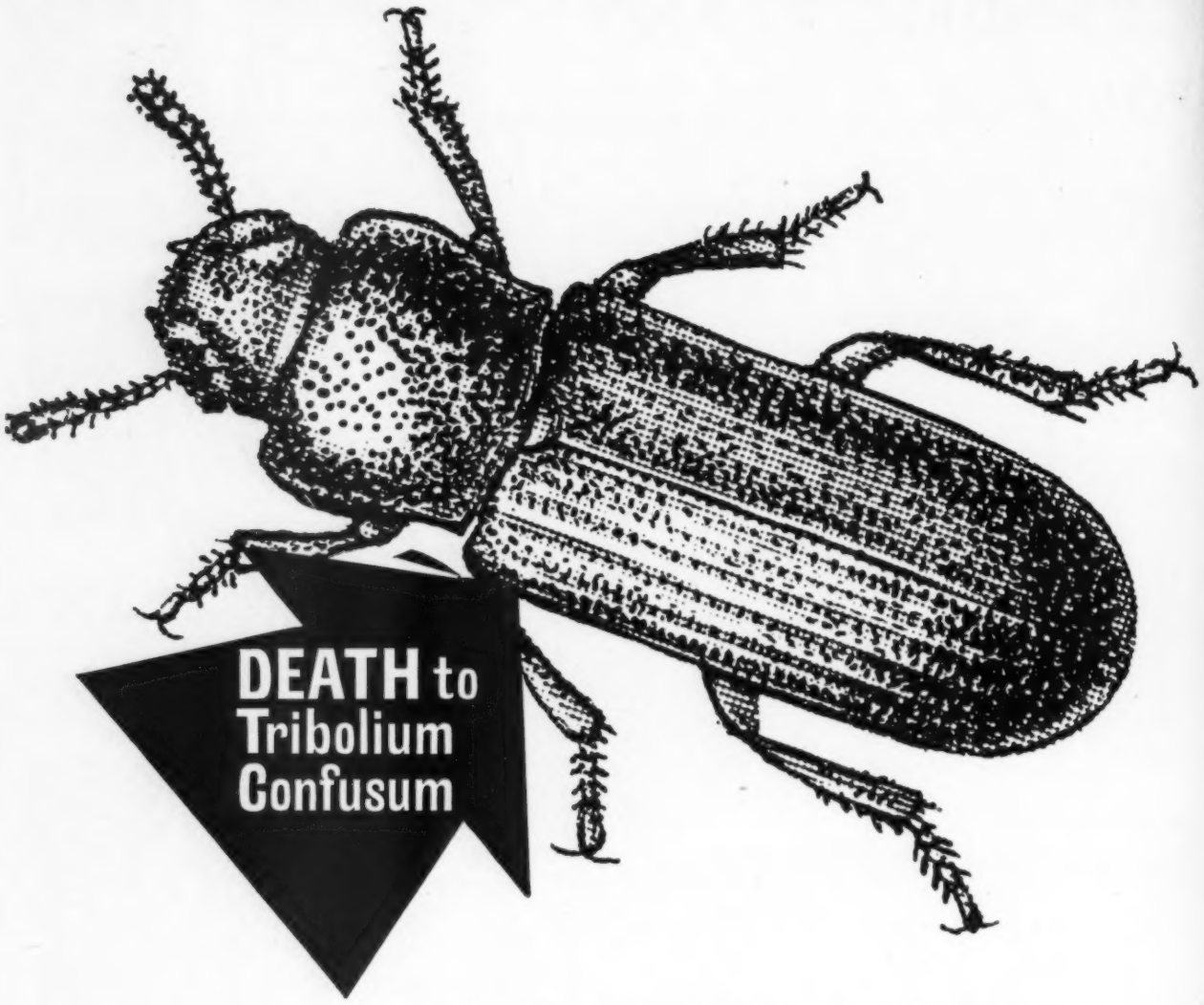

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Bacon · Natural cheese in wedges · Processed cheese in slices

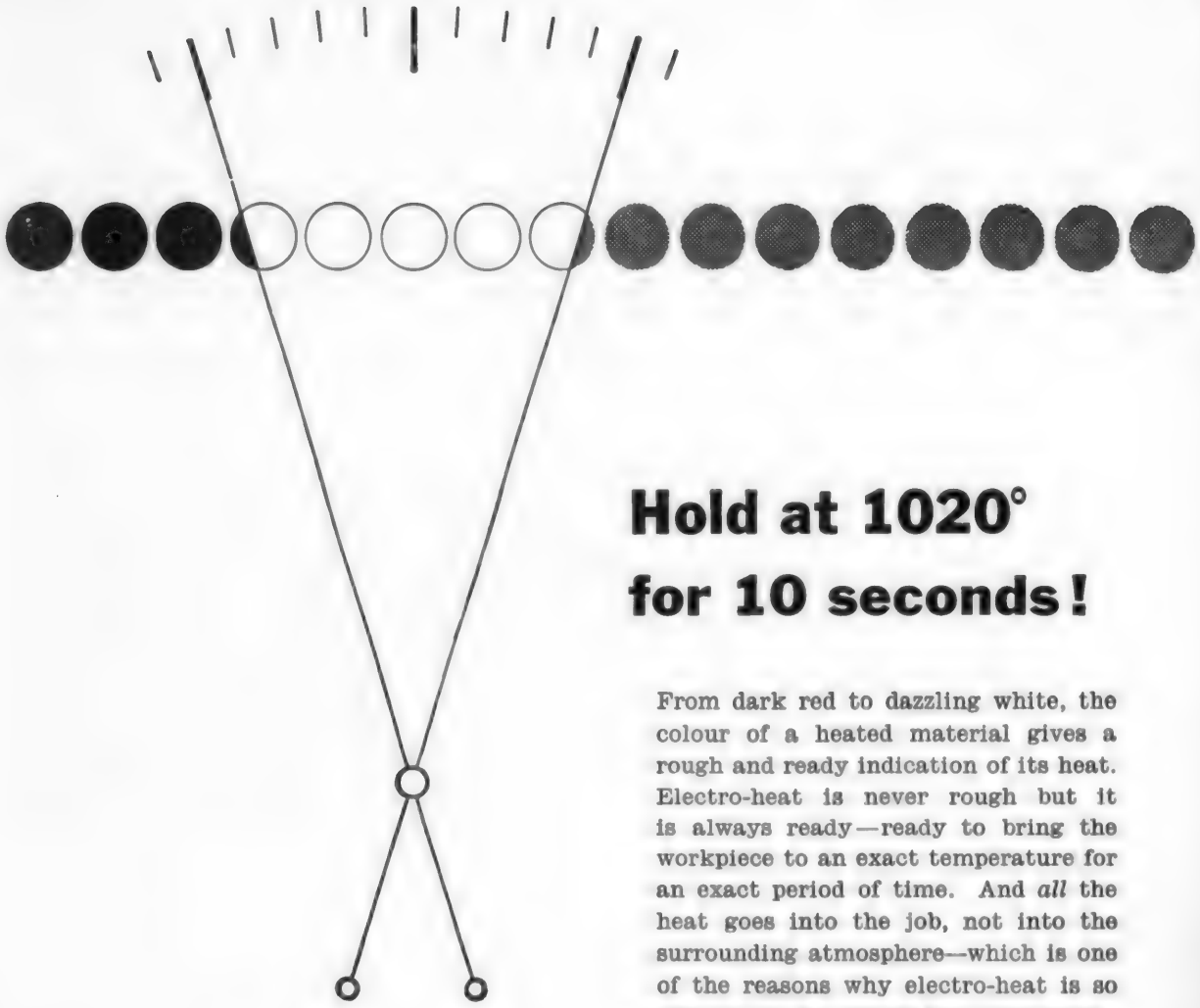
DRY FOOD PRODUCTS
Cereals · Cocoa · Confectionery · Dried Fruits · Dried Vegetables · Gelatine · Ground Coffee or Coffee Beans · Jelly Powders · Lemonade Powders (non-effervescent) · Macaroni · Mustard Powder · Nuts · Popcorn · Rice · Spices · Sugar

LIQUID FOOD PRODUCTS
Pickled vegetables in vinegar such as: Beetroot · Cabbage · Gherkins · Onions

DEEP FROZEN PRODUCTS
Metathene helps to give extended shelf life to deep frozen kippers, and keeps down odour.

THE METAL BOX COMPANY LIMITED · *Plastics Group* · **37 Baker Street · London W.1 · Hunter 5577**

MB 20/58



Hold at 1020° for 10 seconds!

From dark red to dazzling white, the colour of a heated material gives a rough and ready indication of its heat. Electro-heat is never rough but it is always ready—ready to bring the workpiece to an exact temperature for an exact period of time. And *all* the heat goes into the job, not into the surrounding atmosphere—which is one of the reasons why electro-heat is so economical for precise heat treatment.

In every industry, for scores of applications, electricity means higher productivity.

Electricity for Productivity

'Induction and Dielectric heating', just published, is a very important addition to the E.D.A. series of books on Electricity and Productivity. Other titles available are Electric Motors and Controls, Higher Production, Lighting in Industry, Materials Handling, and Resistance Heating. Price 8/6. or 9/- post free.

If you would like further advice or information on how electricity can improve productivity, get in touch with your ELECTRICITY BOARD, or with E.D.A. They can lend you, without charge, films about the uses of electricity in industry.

Issued by the
British Electrical Development Association
2 Savoy Hill, London, W.C.2

The *right* concrete structure . . . by Truscon

The long-cylindrical barrel shells provide the ideal hygienic, light-diffusing roofs for a bakery, and the portal frames in two ninety-ft. spans — the biggest in the country, we believe — just the obstruction-free spaciousness needed for a store building.

Truscon has experts in designing and constructing in all reinforced and prestressed concrete techniques, new and traditional: by calling us into your consultations, preferably at the earliest planning stage, you will be sure of having the most efficient and economical concrete structure for your particular purpose.

Above

Bakery, Jarrow, for Jarrow & Hebburn Co-operative Society Ltd. Architects: C.W.S. Ltd., Newcastle upon Tyne

Left

Bean Store, Hayes, Middlesex, for The Nestlé Co. Ltd. Architects: Dodge & Reid.

The Trussed Concrete Steel Company Limited
35-41 Lower Marsh, London S.E.1
Telephone: WATerloo 6922
Manufacturers of Truscon Precast Floors and Hy-Rib

q.e.d. Truscon

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introduce the

'BANTAM' low-load 2-3 tonner

with the choice of petrol or diesel engine

Easy to handle, and with a high degree of driver comfort, this quality-built truck will give thousands of miles of trouble-free service, and is available with alternative wheelbases.

SALIENT FEATURES

- **Light diesel engine developing 54 b.h.p., or 4 cyl. o.h.v. petrol developing 53·5 b.h.p. with long-life chrome bores.**
- **Full forward control with over 11′ bodyspace on 8′ 2″ w.b. chassis; over 14′ on 10′ 2″ w.b. chassis.**
- **Gross vehicle weight 99 cwts.**
- **Low platform easier and quicker to load.**
- **Exceptional manœuvrability.**
- **Powerful hydraulic brakes.**
- **Comfortable all-steel cab of imposing appearance.**

A ROOTES PRODUCT—BUILT STRONGER TO LAST LONGER!

KARRIER MOTORS LTD. LUTON EXPORT DIVISION: ROOTES LTD. DEVONSHIRE HOUSE PICCADILLY LONDON W.1

FABLOTHENE

the packaging material with an infinite capacity for taking strains

No other packaging material has so many positive advantages as Fablothene, super-transparent, tear-resistant polythene that's ideal for packaging an almost limitless range of wet or dry goods either in bulk or as individual retail items. For Fablothene stands up to all the stresses and strains of storage and selling . . . it keeps *out* water, damp and dust . . . it keeps in flavour and freshness and it has an extremely low moisture-vapour transmission. What's more, Fablothene *shows* what it *preserves* . . . makes everything look fresh, appetising, irresistible! Fablothene bags open easily and can be used successfully in conjunction with automatic packaging systems.

TIME OR TEMPERATURE DON'T BOTHER FABLOTHENE. Fablothene is a single substance. It contains no toxic plasticizer, which after a time could migrate from the packaging to its contents, and in turn allow the polythene to become hard and brittle. Likewise, Fablothene remains flexible over a range of temperatures from −40°C to 100°C so it can be safely used for deep-frozen foods and export packaging. In the case of the latter, special heavy-quality Fablothene is manufactured for export and other circumstances where conditions are particularly rough.

CHEMICALLY RESISTANT. Fablothene is quite unaffected by dilute acids and only slightly by concentrated acids. It is also proof against fungi, salt and sea water and will not support mould growth.

FABLOTHENE CARRIES YOUR MESSAGE. We supply Fablothene ready-printed in up to four colours to a design supplied by you or our own studio. Ask to see specimens. They're outstanding! The Fablothene range includes layflat tubing, sheet film and bags in thicknesses from 120 gauge to 500 gauge. Layflat widths are from 2″ to 48″, with other widths and gauges produced to special order. **Before you decide on another packaging product, you must see samples of FABLOTHENE.**

Write or telephone for full details to:

ANGLO-AMERICAN PLASTICS LIMITED

1 Avery Row, Grosvenor Street, London, W.1.
Telephone: HYDe Park 9261

One of the CP Group of Companies

FABLOTHENE resists everything except the customers' attention

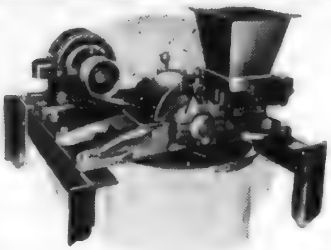
ENSURE PERFECT GRINDING AND BLENDING

OF YOUR MATERIALS . . . .

with

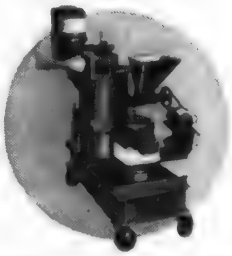
MIKRO EQUIPMENT

The MIKRO-PULVERISER



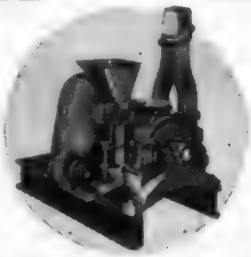
A high speed mechanical pulveriser offering a wide range of particle sizing, granular to fine grind (10—300 mesh) safe and economical for both wet and dry grinding.
Available in six sizes with capacities from 10—10,000 lbs. per hour.

The MIKRO-BUD



A new vertical hammer mill with built in air classifier for the reduction of solids to within the 80—10 micron range. Particle sizing can be changed in seconds while the machine is in operation.
10°F. maximum temperature rise.
Available in two sizes giving 35/70 lbs. per hp/hour.

The MIKRO ATOMISER



A mechanical, screenless mill for the production of smooth, ultra-fine powders in the lower micron range (25—1 microns). Compact and highly efficient.
Available in three sizes with capacities from 5—5,000 lbs. per hour.

100% dustless operation can be achieved by connecting any of the above machines to one of our MIKRO FIL UNITS

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Tee-Pak is pleased to announce

the Appointment of

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Telephone: PADdington 7431-7

as Exclusive Distributors in

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the perfect cellulose casing

for your skinless pork sausages and frankfurters.

They will be pleased to serve you

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Tee-Pak, Inc. TEE-PAK **CHICAGO, ILLINOIS, U.S.A.**

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Super Grade YEATEX

Using a new de-bittering process, we have eliminated the bitter, yeasty bite from yeast extract whilst retaining its nutritional value and vitamins of the B Complex in their correct balance. *Super Grade* Yeatex—as we have very properly called this improved extract—has a delicate aroma and flavour and is smooth and irresistible to the taste. By adding a subtle piquancy to many products it dispenses with synthetic flavourings. The finest yeast extract obtainable, *Super Grade* Yeatex has a place in many foods. Has it one in yours? We'll be happy to advise you.

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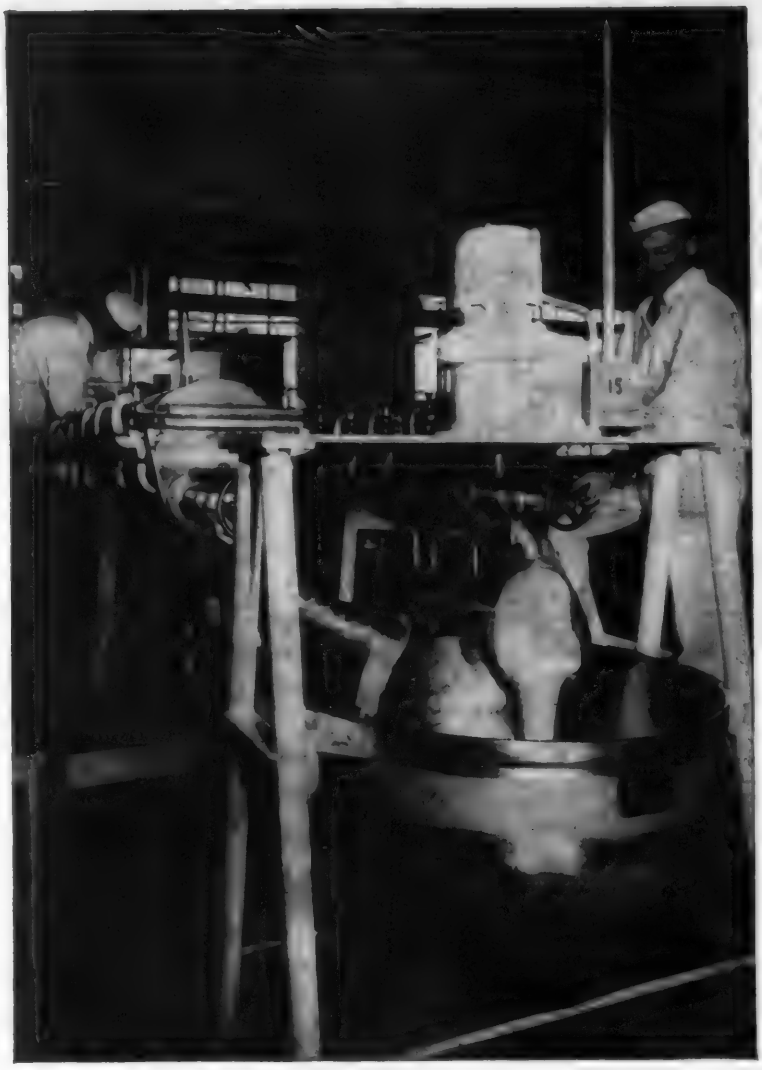

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Registered Trade Marks

STAINLESS STEEL

. . . *safeguards your health*

In the preparation of foodstuffs, scrupulous attention to cleanliness is essential. That is why this modern plant for the production of cheese makes extensive use of stainless steel for all metal parts in contact with the product. Freedom from contamination and ease of cleaning are two of its main advantages.

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The metal of the age

THE UNITED STEEL COMPANIES LTD

SAMUEL FOX & COMPANY LIMITED

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A THOUGHT FOR FOODS

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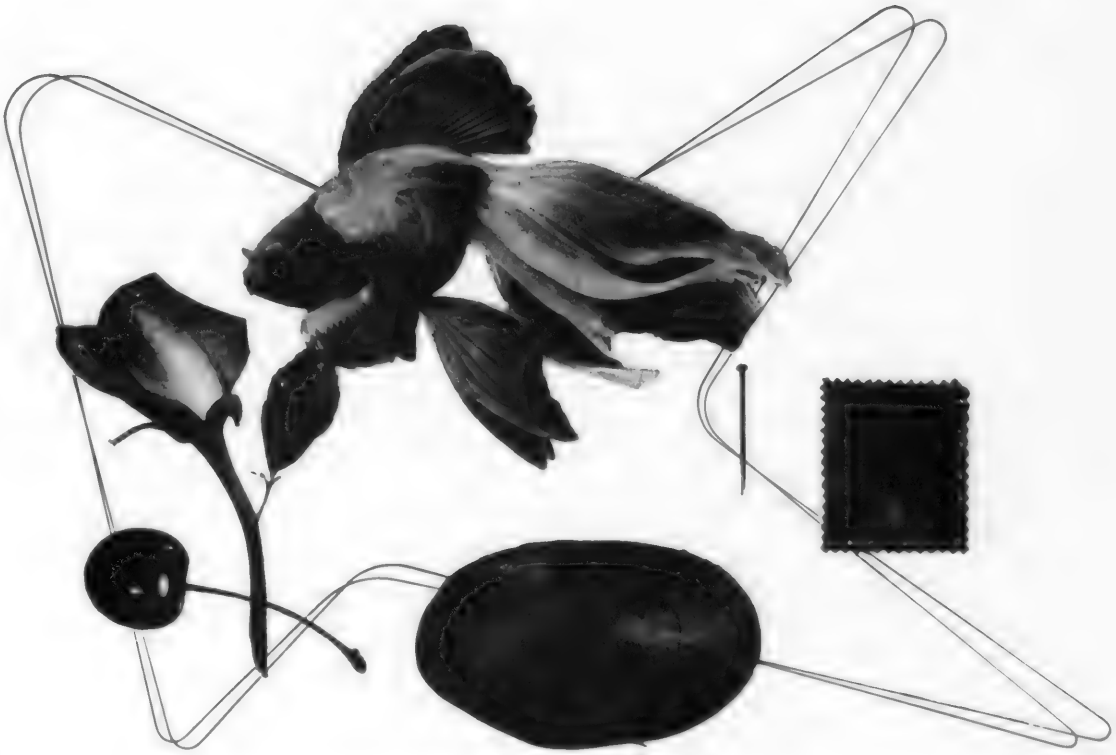
MUNTON & FISON LIMITED

CEDARS FACTORY STOWMARKET SUFFOLK

Maltsters for more than a Century



THIS, THAT AND THE OTHER...

... transparent packaging films play a unique role in protecting and "moving" merchandise of every description. The variety is almost infinite.

So, too, is the variety of films. As the largest manufacturers of cellulose film in Europe and the Commonwealth and makers of the famous "Cellophane" film, as makers of B.C.L. polythene film and sole agents for Courtaulds' cellulose acetate film, we are proud of our ability to supply films in types and gauges to suit every product.

Our scientists, top men in their field, in constant touch with the world's merchandising problems and solutions, work continuously to produce new and improved films such as MXXT-type "Cellophane" (the most moistureproof packaging film in the world), polythene-coated "Cellophane" and special films for wrapping fresh meat, fruit and vegetables, and quick-frozen foods, for instance.

Colodense Ltd., an associated company, has an international reputation as high-quality colour-printers and converters of transparent films.

In addition, we offer an incomparable service—help with technical, machine and package-design problems.

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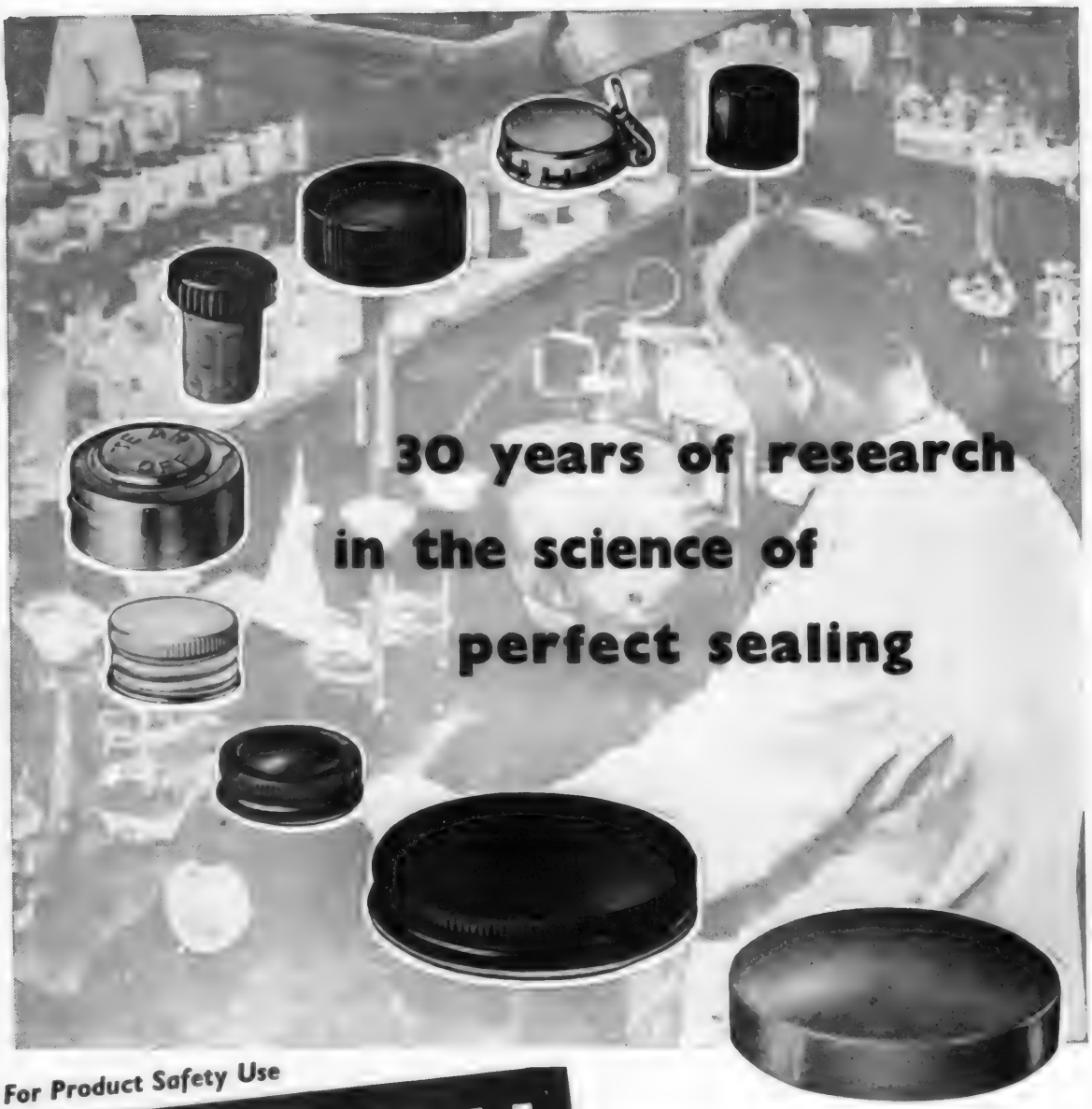
"Cellophane" is the registered trade mark of British Cellophane Limited and denotes the brand of cellulose film manufactured by them.



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WITH UGB GLASS CONTAINERS

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UGB CLOSURE DIVISION

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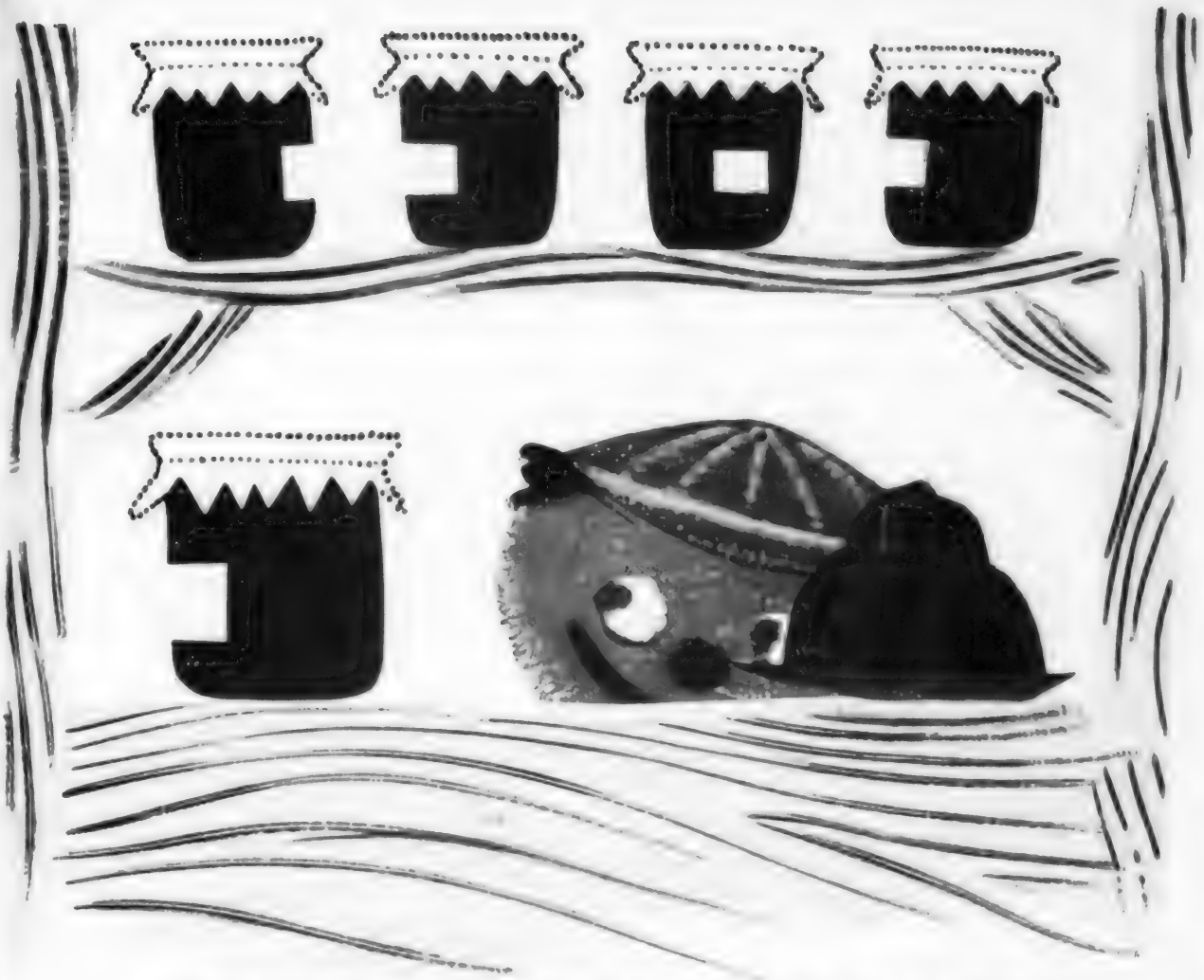

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for JAMS, JELLIES and SWEETS

Edicol Supra Colours meet the highest standards of purity demanded by the most stringent regulations in the world.

Their purity is protected by delivery in sealed packages.

"Certified" supplies of many are available for food processors exporting to the United States.

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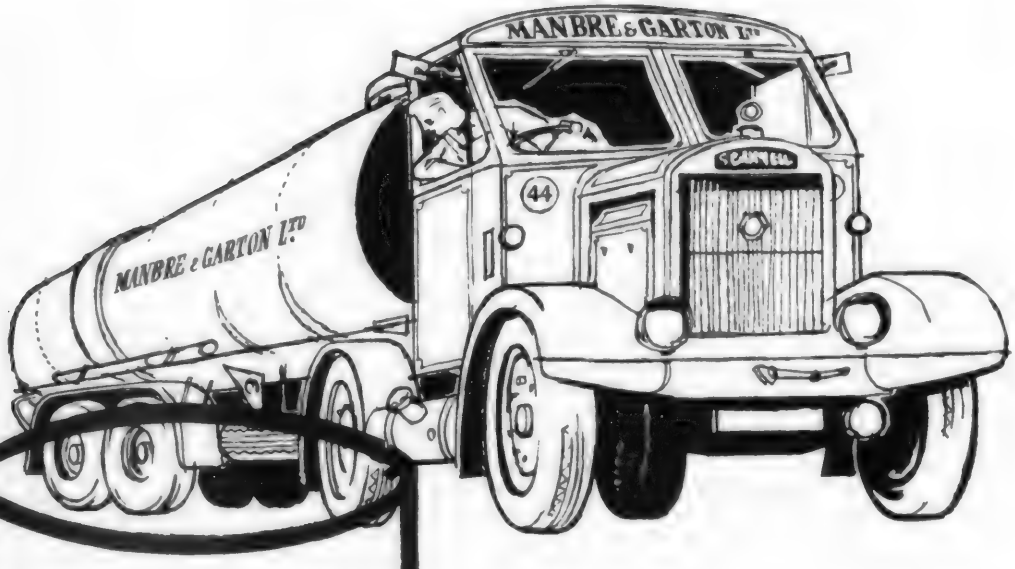

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London's largest washing-up machine

A giant washing-up machine has just been installed at the Stratford factory of Excel Limited, the well-known manufacturers of sausages and pies.

This machine is one of the first to be installed in a sausage factory and grew from an idea of members of the Company's staff, who were impressed by the efficiency of the washing-up machine in the factory's canteen.

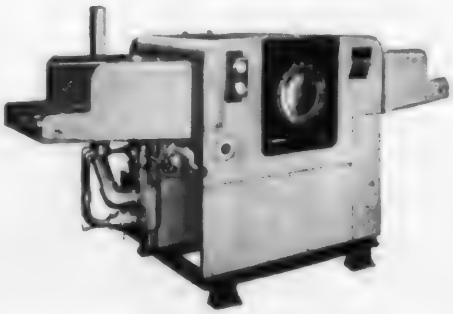
As a result all the utensils in general use were sent to the firm who made the Dishwashing Machine with a request that they build a machine to wash them all.

Mr. E. E. Burrage, M.I.Mar.E., chief engineer at Excel's Stratford factory, and the man who had the responsibility for the machine's installation, describes the machine as "one hundred per cent. efficient."

Previously 25 men were engaged laboriously scrubbing hundreds of trays and moulds, a job which the machine now takes in its stride.

This *Dawson* washing machine does 25 men's work

It washes all the utensils used at the Stratford factory of Excel Ltd. for the manufacture of their Sausages and Pies. Other Dawson washing plant is in daily operation in all branches of the Food Manufacturing Industry.



AUTOMATIC BAKERS' TRAY WASHING & RINSING MACHINE

Handles trays up to 24 in. wide. Heating—Steam, Gas or Electric. This is our smallest machine occupying only 9 ft. by 3 ft.

DAWSON BROS. LTD., Gomersal, Nr. LEEDS. Tel.: Cleckheaton 1080 (5 lines)

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BOEHM EXPERIMENTAL KITCHEN

As acknowledged experts in the field of food flavouring it is possible that we have the answer to your immediate flavouring problem. If not, the Boehm Experimental Kitchen will get to grips with it and do its best to find a solution. This service is absolutely free and, needless to add, is becoming more and more popular with manufacturers. Incidentally, many products today owe a great deal to the shrewd advice and technical help of Fredk. Boehm Ltd. Why not put your problem in the post to them NOW?

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AJI-NO-MOTO
Mono-sodium glutamate 99% pure.

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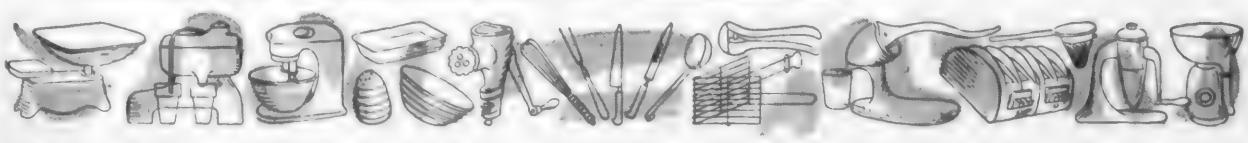

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to ensure complete sterility

Only one trouble-spot in your production and packaging line is sufficient to cause you serious dislocation, and loss of valuable finished product. B.H.C. are specialists in tracing the origins of micro-organisms, yeasts and moulds in food processing plant. Over 25 years' experience plus the services of our Analytical, Chemical and Bacteriological Laboratories are at your disposal to isolate the cause of the trouble. Quaternaries, in the form of DECIQUAM will ensure that the trouble is overcome and prevent any repetition. You only have to ring LIBerty 1021 for a B.H.C. Technical Representative to call (anywhere in the U.K.) or write.

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One of the B.H.C. Multi Grade Quaternaries

DECIQUAT
An aqueous solution of DECIQUAM which offers the same qualities in a more easily handled form.

'2000'
The first completely rinsable 'Quat' in the world, yet still retaining the fullest sterilising qualities.

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With over 150 Current models of Centrifugal Separators to choose from and backed by over 75 years experience in their application De Laval can offer you the best advice and the widest range of equipment.

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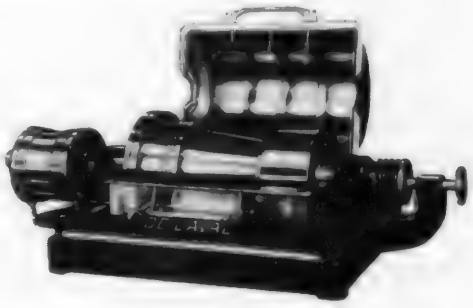

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A Horizontal centrifuge with helical Screw for the continuous Separation of Solids from a Liquid.

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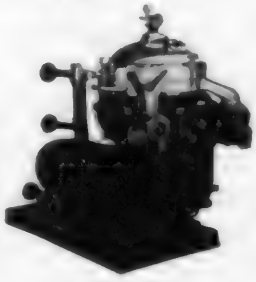
An entirely new high capacity Hermetic Clarifier. Complete freedom from air contact enables gaseous liquids to be processed.

DE LAVAL SELF OPENING SEPARATOR TYPE PX

High efficiency disc type Separator—Discharges solids automatically while running at full speed—Cuts out bowl cleaning —reduces labour.



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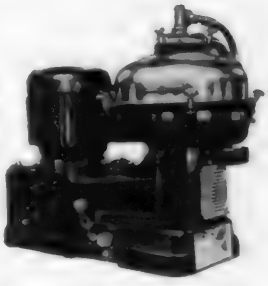
A Hermetic Separator for oil degumming or soapstock separation as used in the De Laval Short Mix Refining Process.

DE LAVAL NOZZLE SEPARATOR QX 212

For continuous discharge of solids in Liquid/Solid separations. High capacities up to 20,000 g.p.h.



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Think of **DE LAVAL** first for your heat-exchange and pumping problem—**DE LAVAL** Stainless Plate Heat Exchangers & Easy-Clean Centrifugal Pumps are the answer

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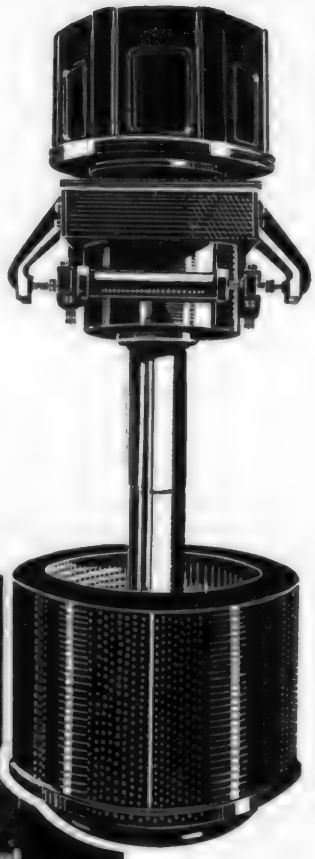
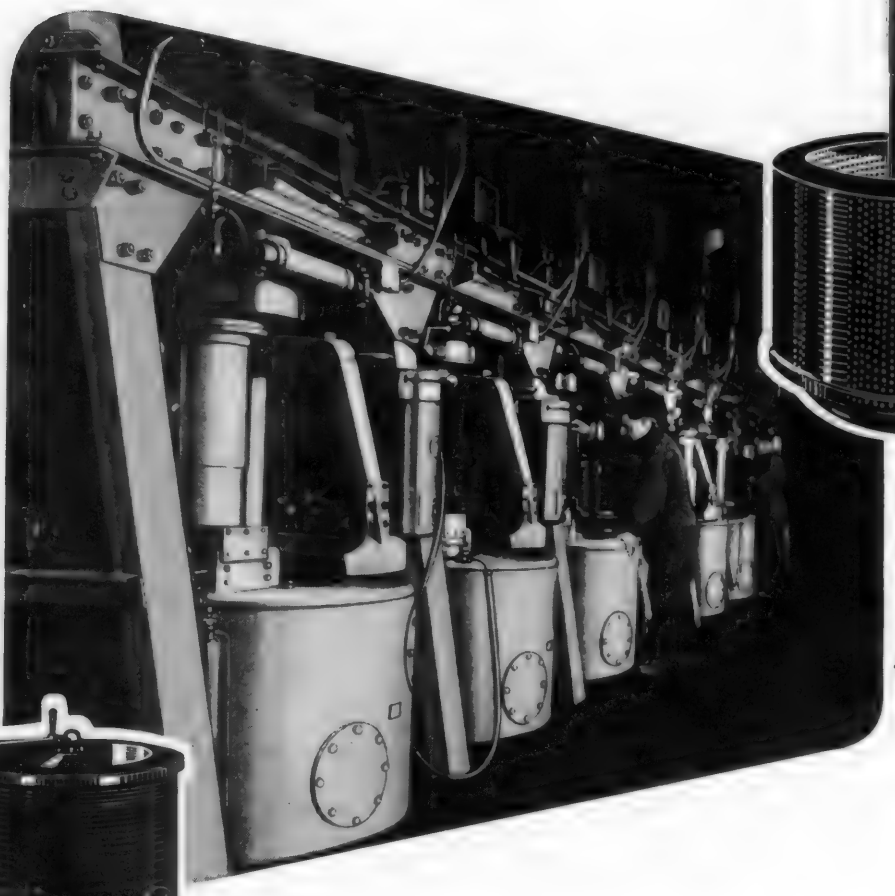
Smee's DL 373

an extensive range–

of HIGH-SPEED CENTRIFUGALS for rapid, hygienic food processing made of suitable corrosion resisting materials





Broadbent high duty sugar centrifugals in a modern sugar factory.

Over 90 years experience in the specialised field of centrifuging enables us to recommend the most satisfactory equipment for increasing your production

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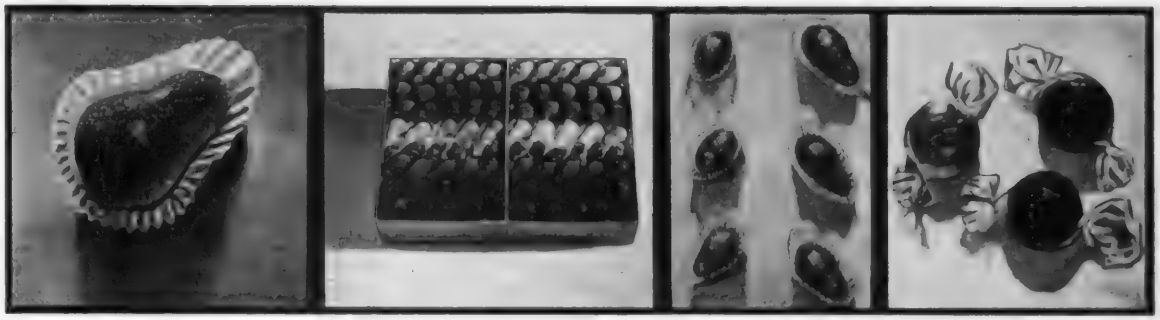

'Globe' glucose for confectioners

With acknowledgments to Taverner and Sons Ltd.

'Globe' liquid glucose, 'Cerelose' powdered glucose, and the wide range of other starch products made by Brown & Polson Limited for confectioners, are the best of their kind—and they are backed by a unique service of technical advice to confectionery manufacturers.

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'Perspex' for modern domelights

FOR UP-TO-THE-MINUTE contemporary roof-lighting choose 'Perspex' acrylic sheet.

Domelights made from 'Perspex' have an exceptionally high light transmission. They cut labour costs because they are easy to fit, long-lasting and require no maintenance. 'Perspex' remains unaffected by weather, humidity and extremes of temperature; it stands up to hard wear.

Special decorative effects can be obtained with 'Perspex' by using transparent or translucent colours. This tough, transparent sheet is simple to shape and form to contemporary designs and is the ideal modern roof-lighting material.

'Perspex' is available in clear or opal sheet and in a wide range of transparent colours. Domelights in 'Perspex' are now obtainable from several manufacturers and dealers. Write to your nearest I.C.I. sales office for their names and addresses.

'PERSPEX' today — for tomorrow

'Perspex' is the registered trade mark for acrylic sheet manufactured by I.C.I.

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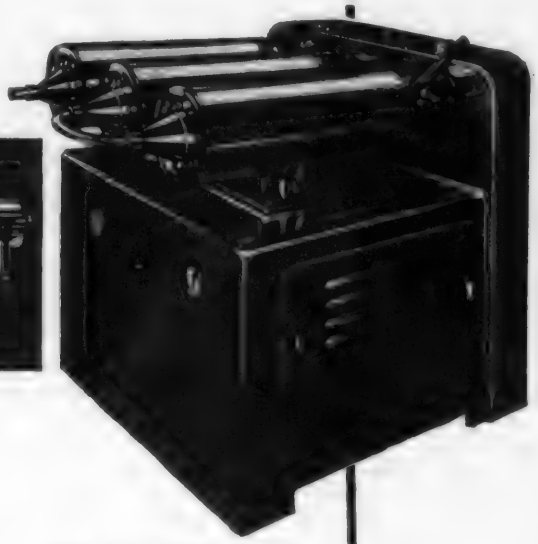
FOR IMPROVED PRODUCTS AND LOWER PROCESSING COSTS

Rota-Pro Continuous Processing operates through a closed, mechanically controlled system which brings a small volume of product into intimate contact with a large heat transferring surface.

Heat transfer is rapid and efficient, resulting in a uniformity of treated material and a greatly improved final product. Rota-Pro requires minimum operator attention, maintains the highest standards of hygiene and offers big economies in processing time and labour. Wide capacity range.

HOW ROTA-PRO WORKS

A clean heat transfer service is constantly exposed by revolving scraper blades. This together with the high ratio of heat transfer to volume of treated product, assures intimate contact and efficient mixing.



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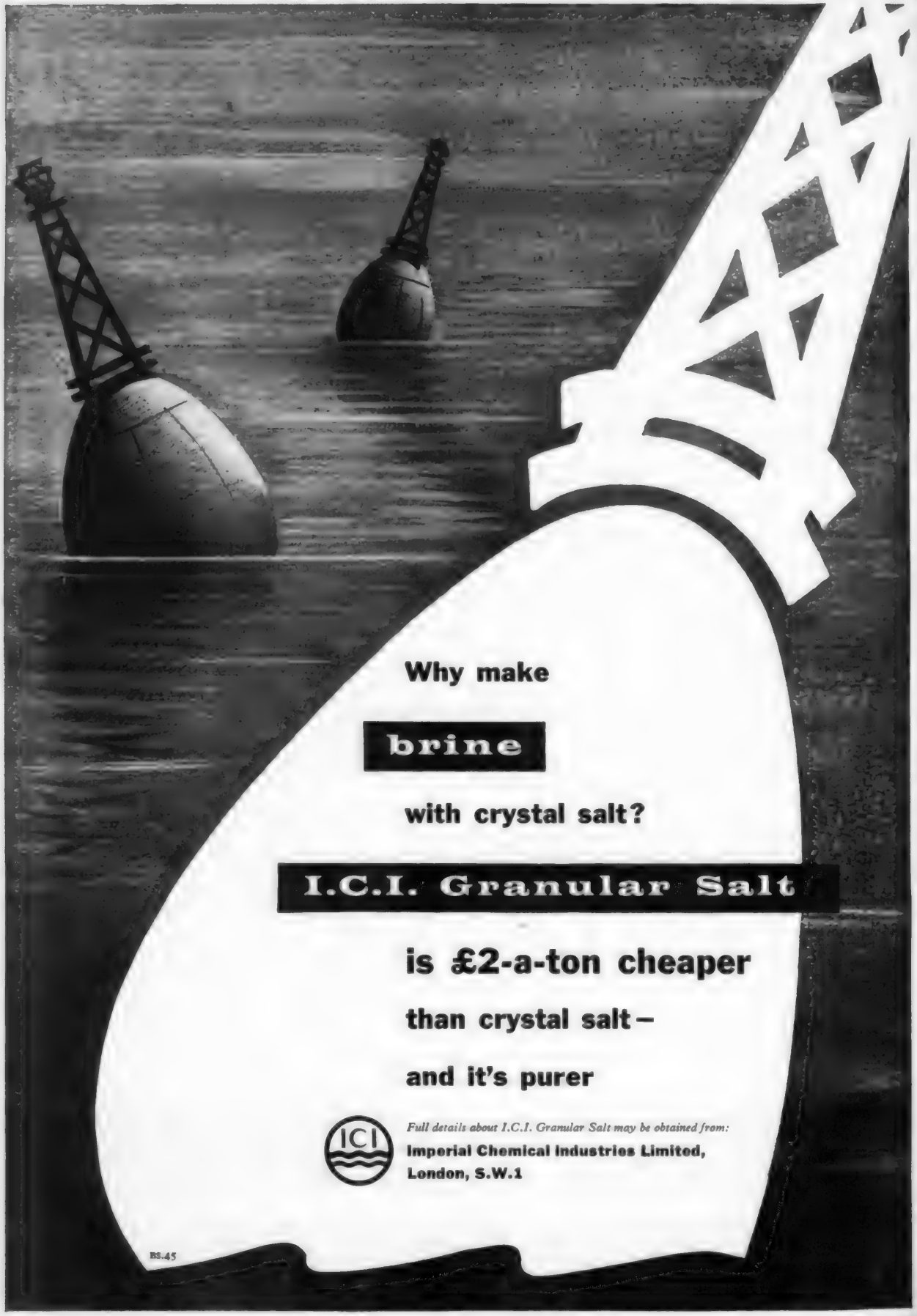
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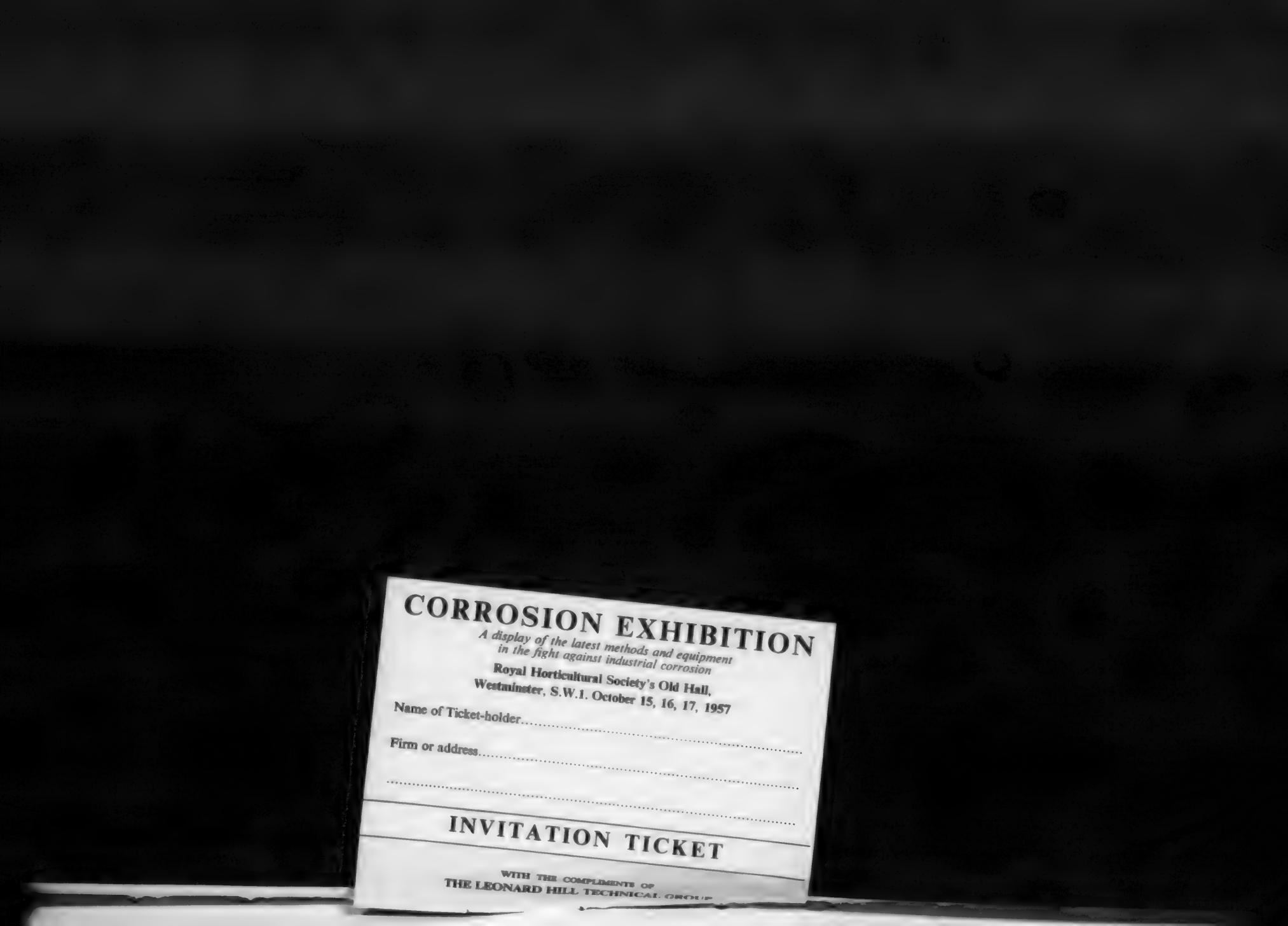
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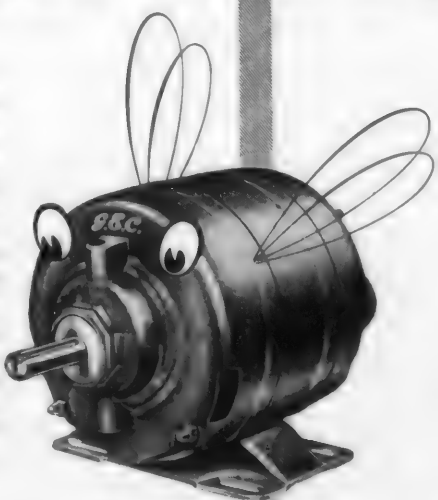

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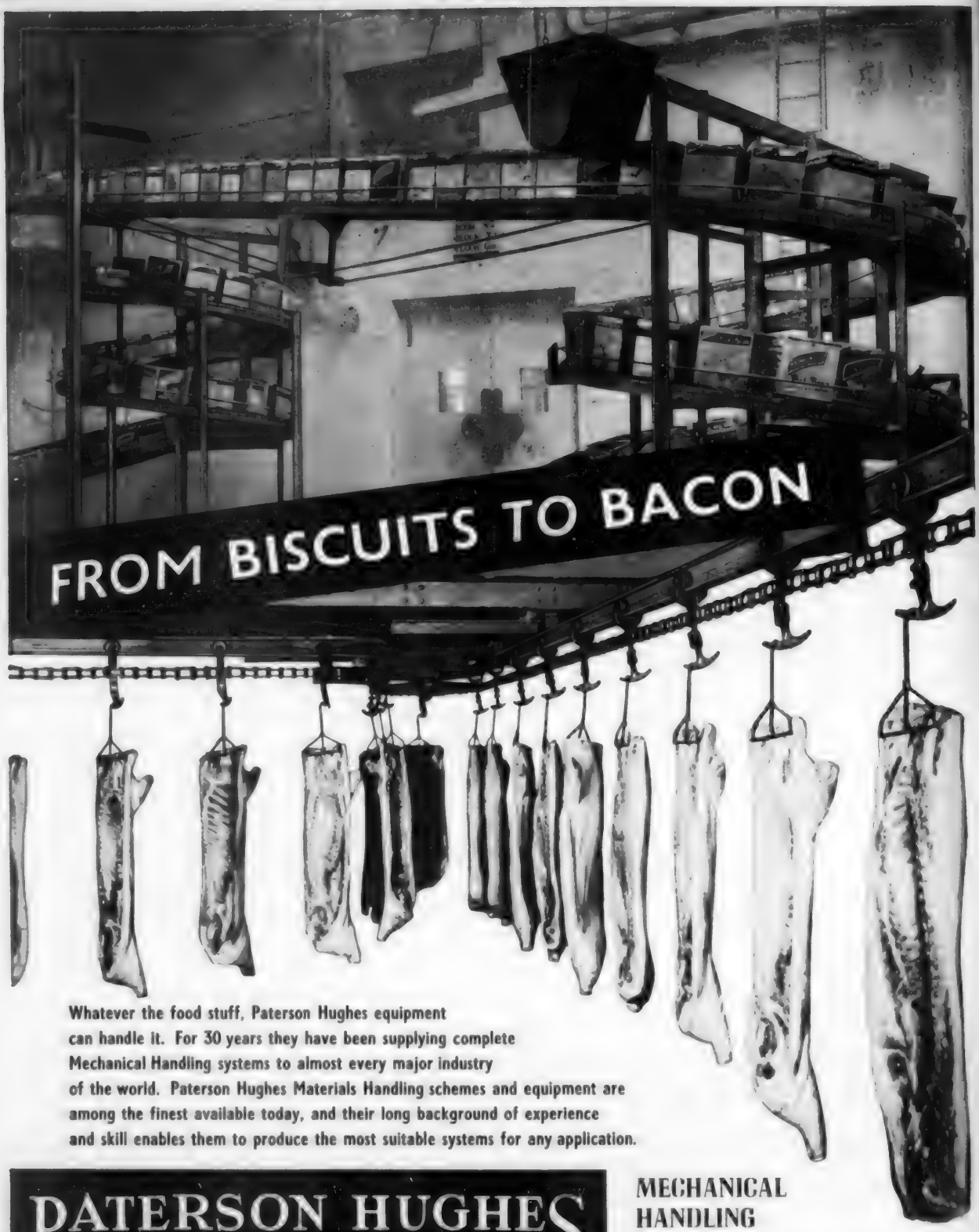

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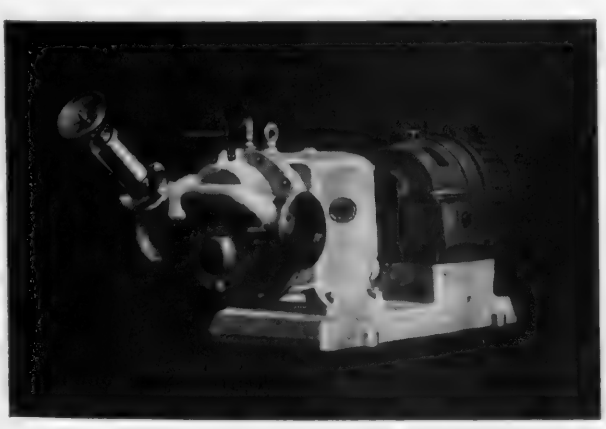

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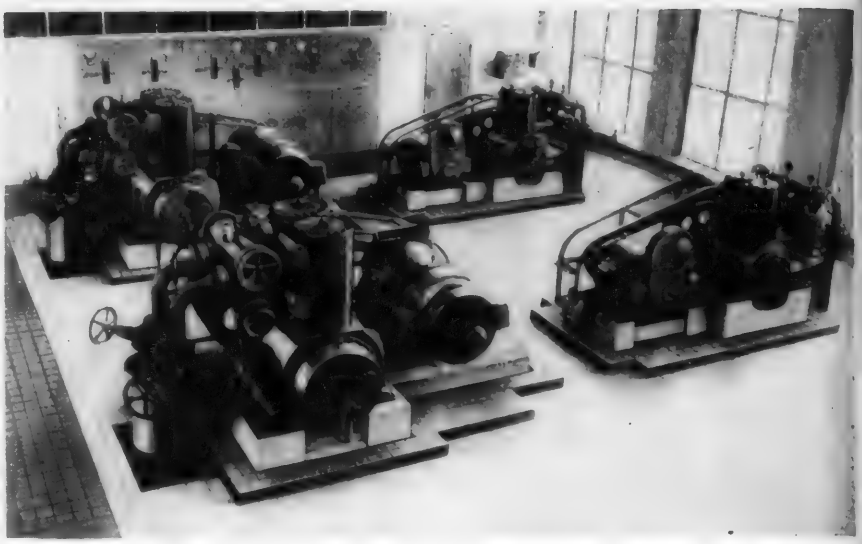

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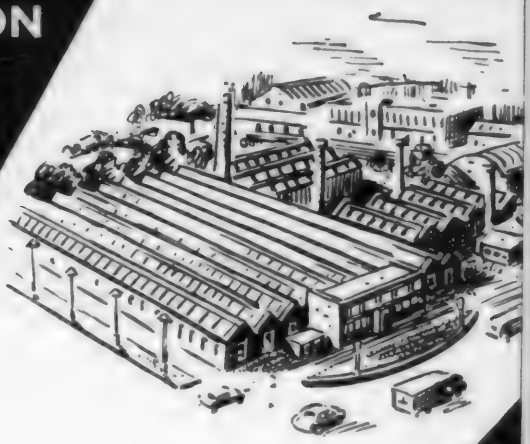

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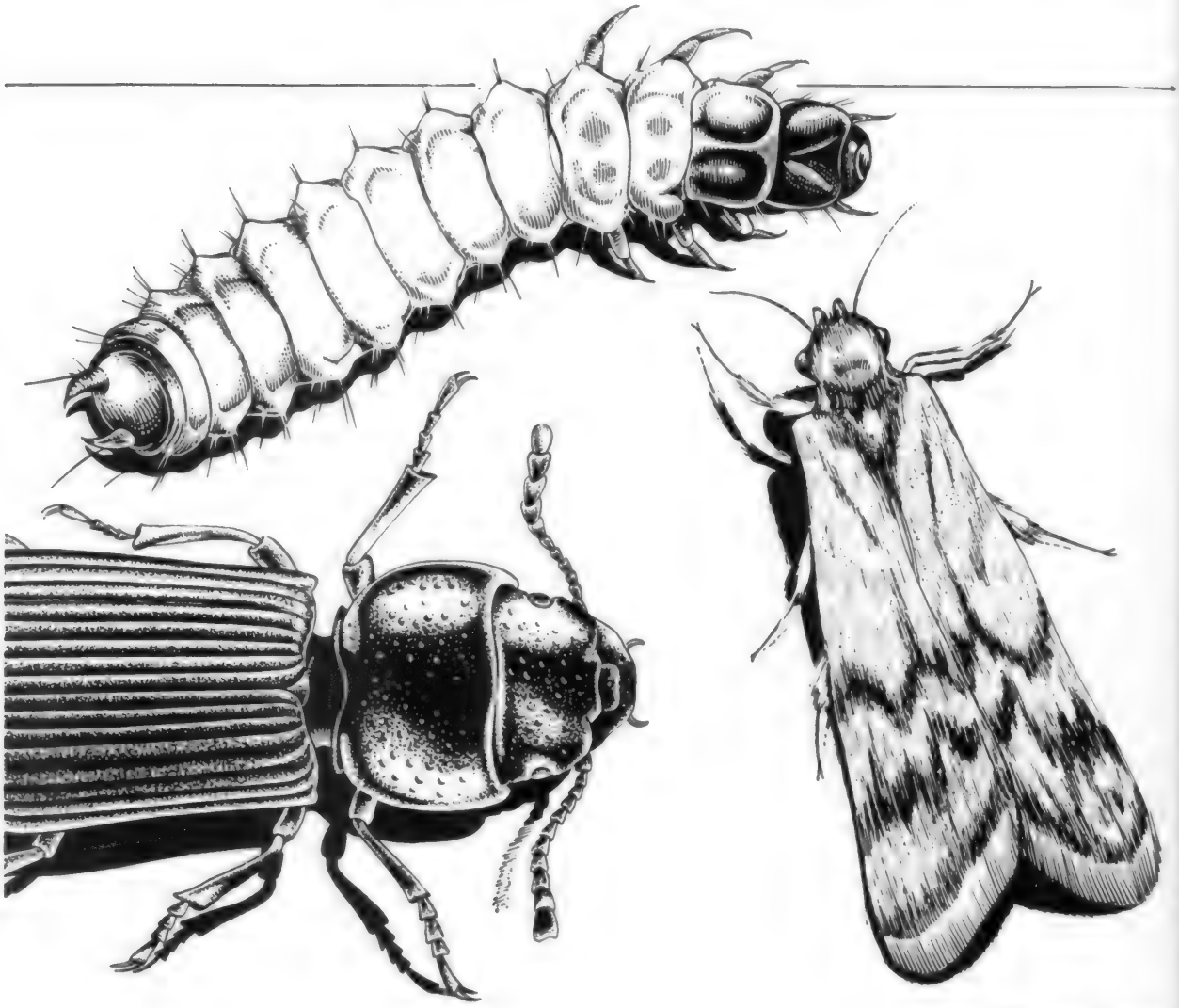

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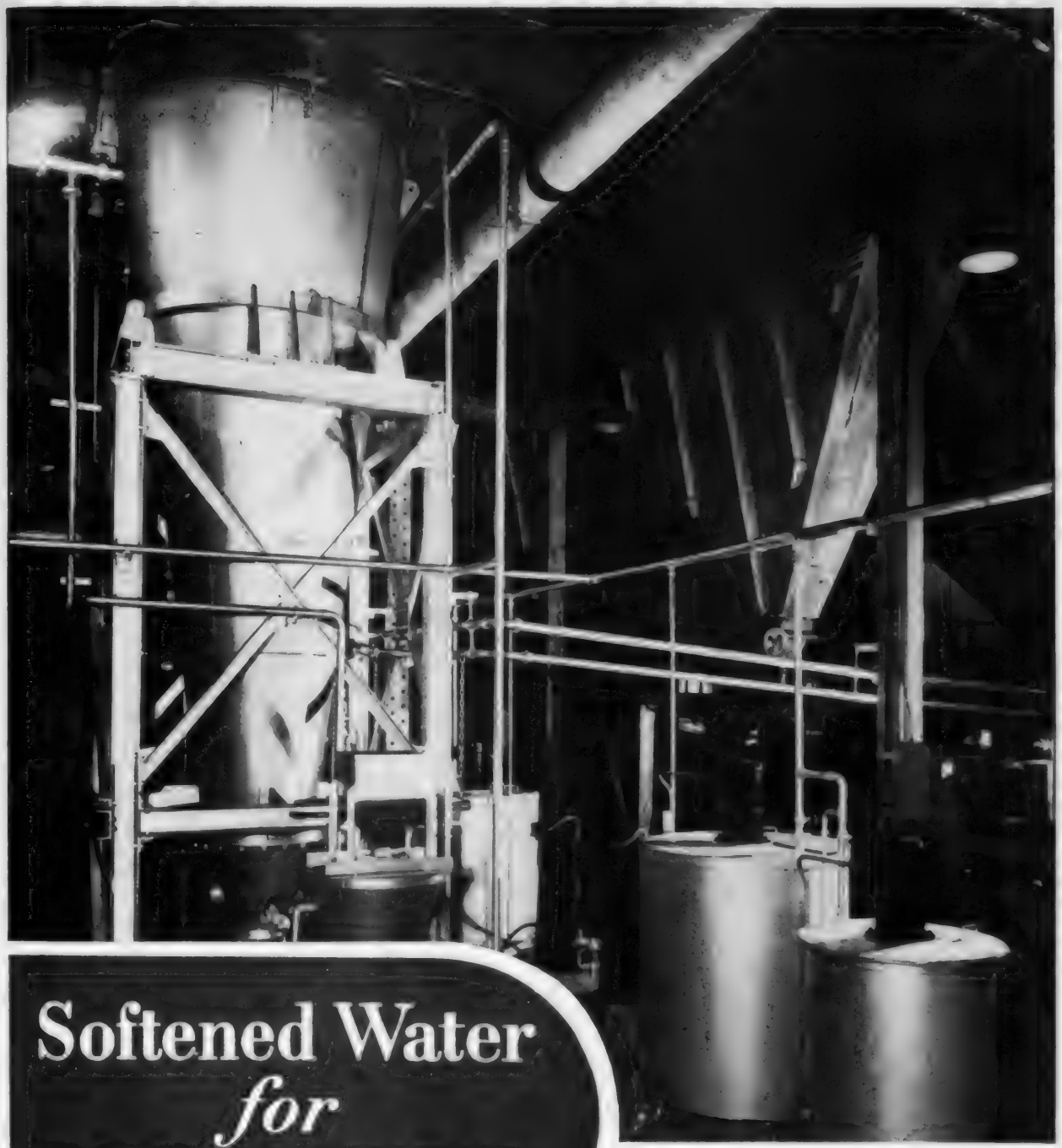

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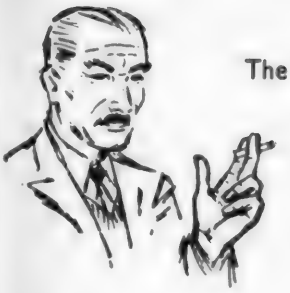

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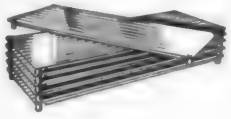

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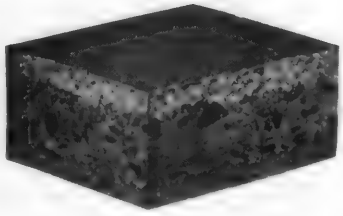

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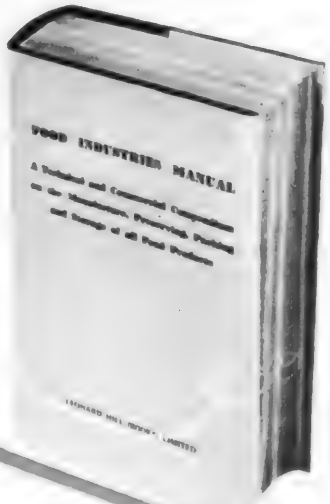

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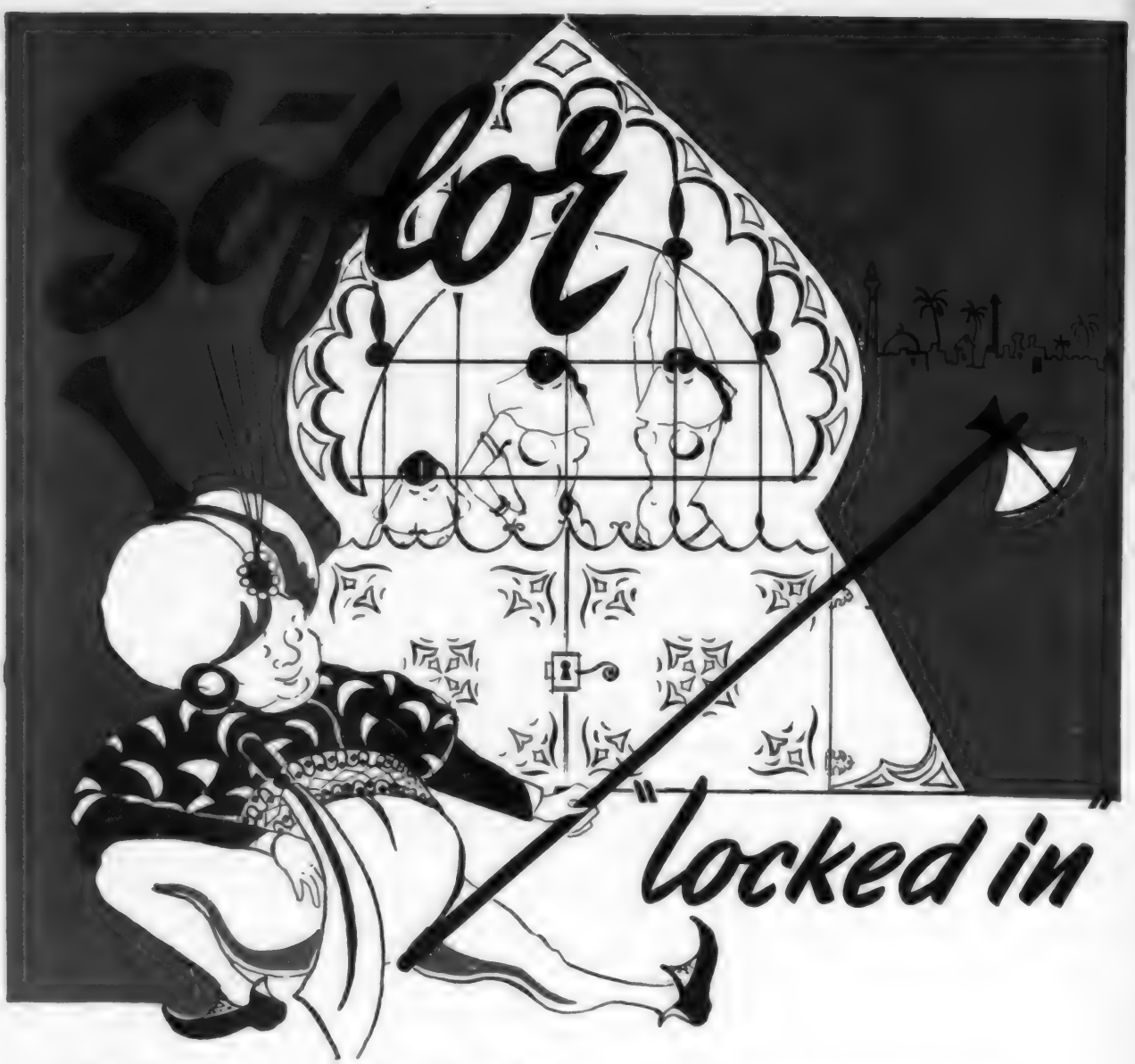

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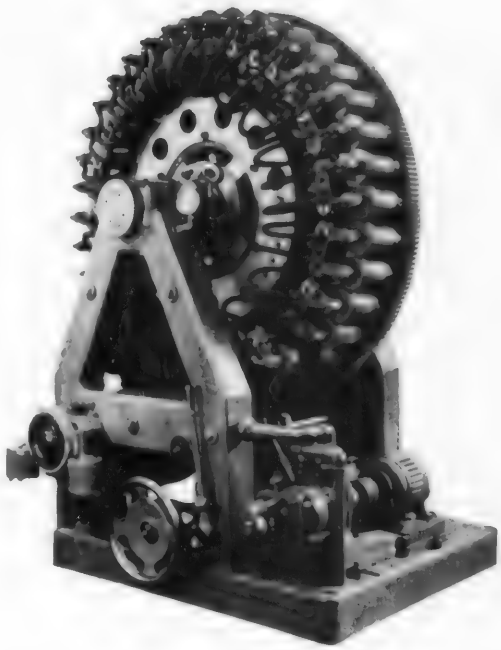

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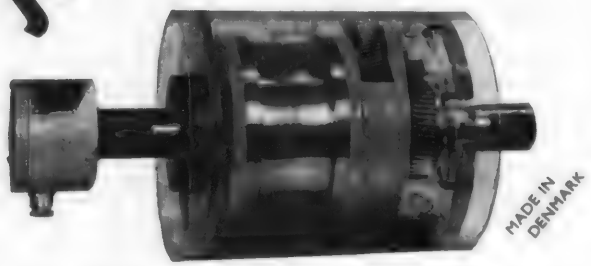

The illustration is of a transparent model to show mechanism.

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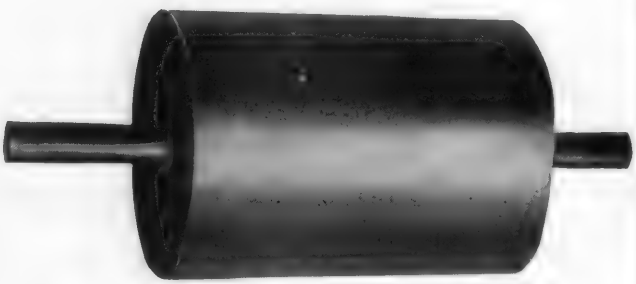

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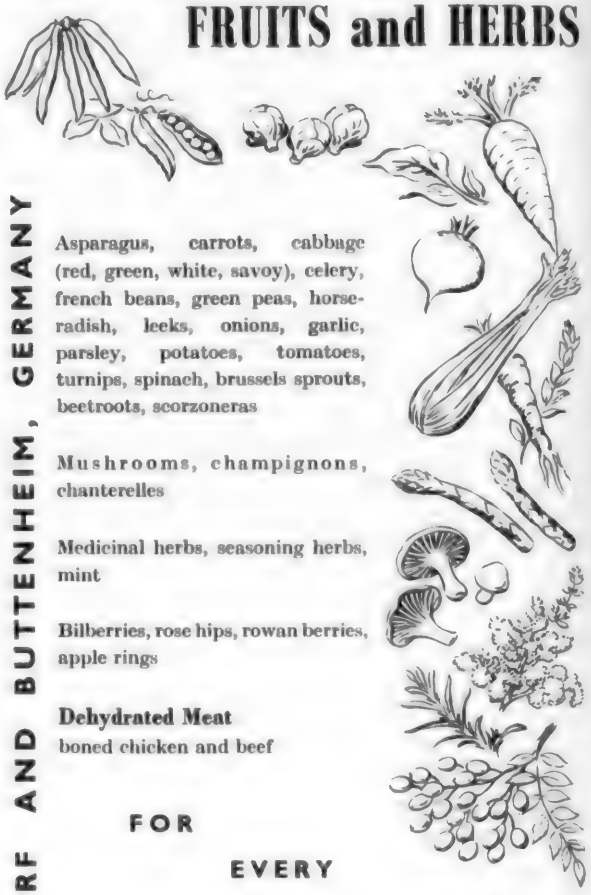

Asparagus, carrots, cabbage (red, green, white, savoy), celery, french beans, green peas, horse-radish, leeks, onions, garlic, parsley, potatoes, tomatoes, turnips, spinach, brussels sprouts, beetroots, scorzoneras

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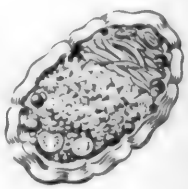

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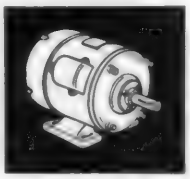

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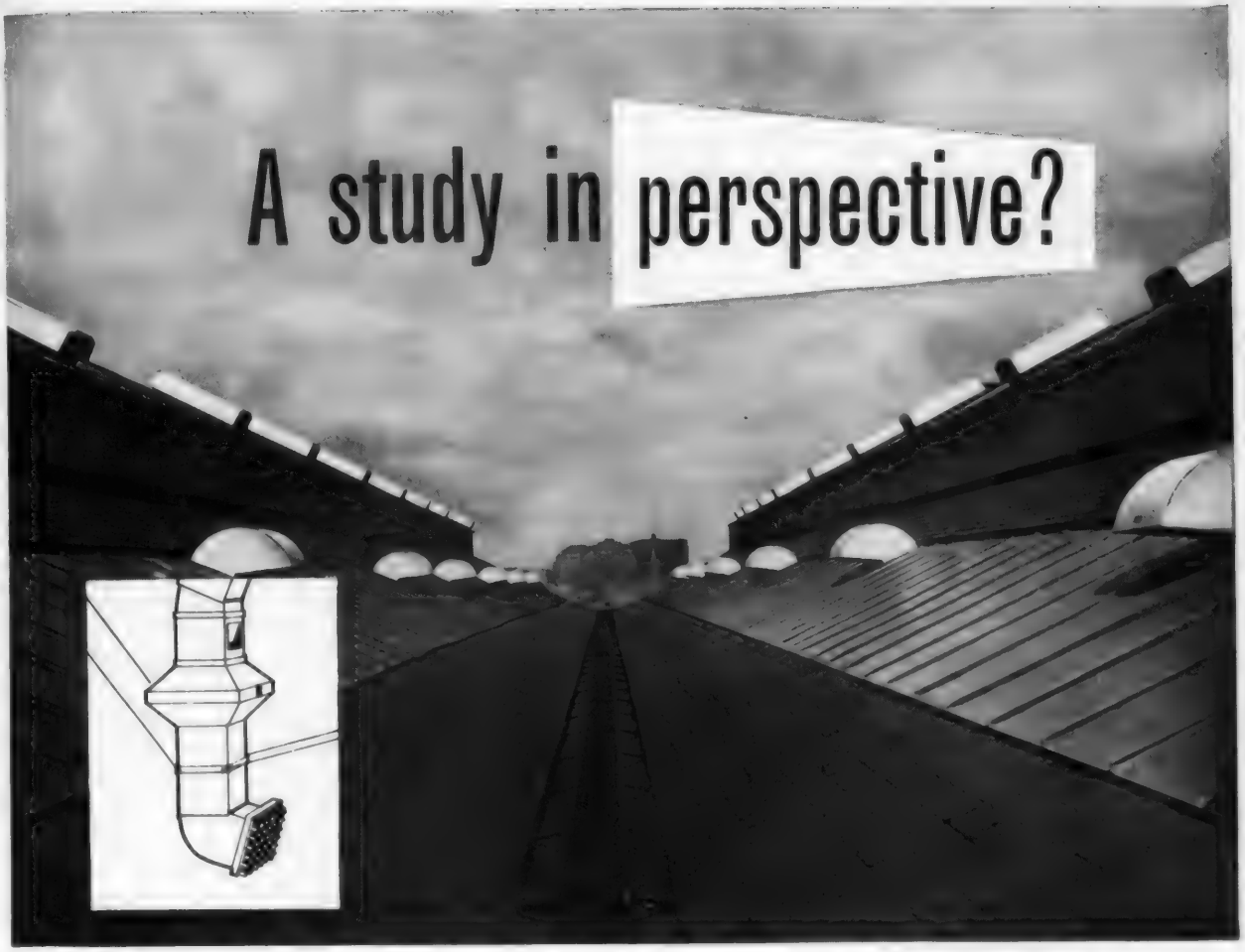

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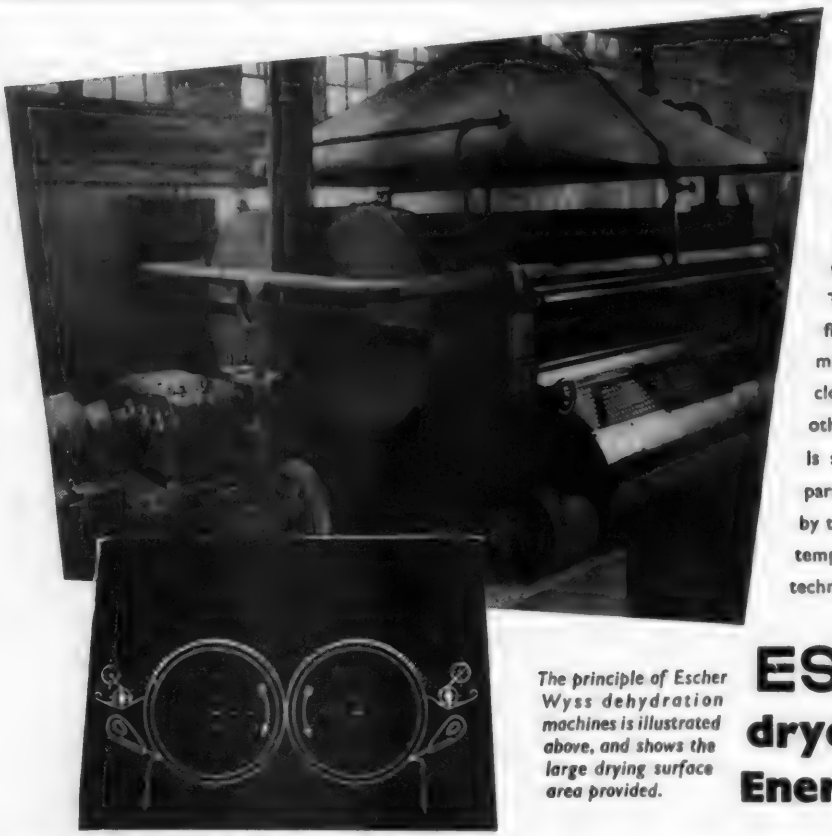

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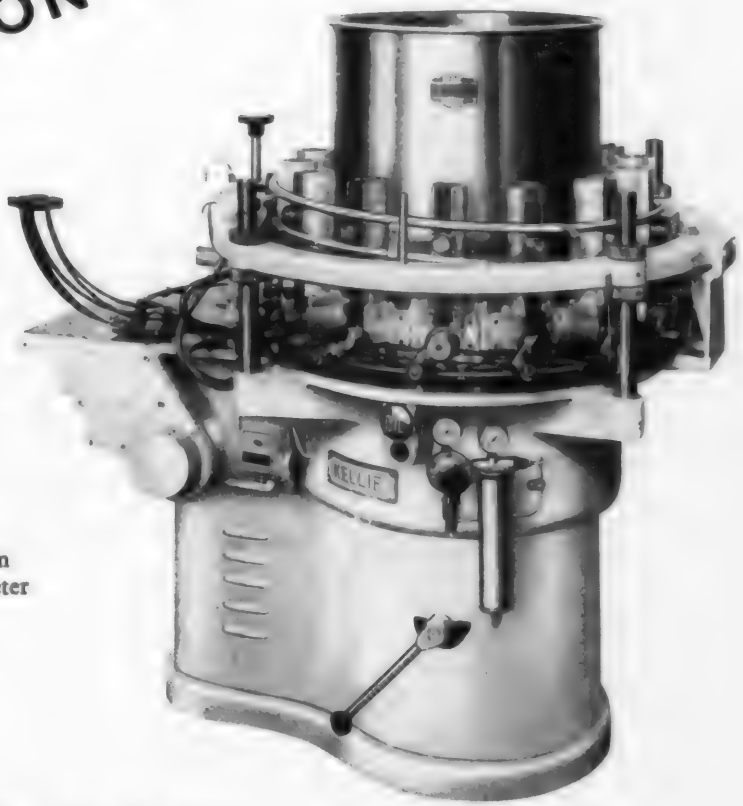

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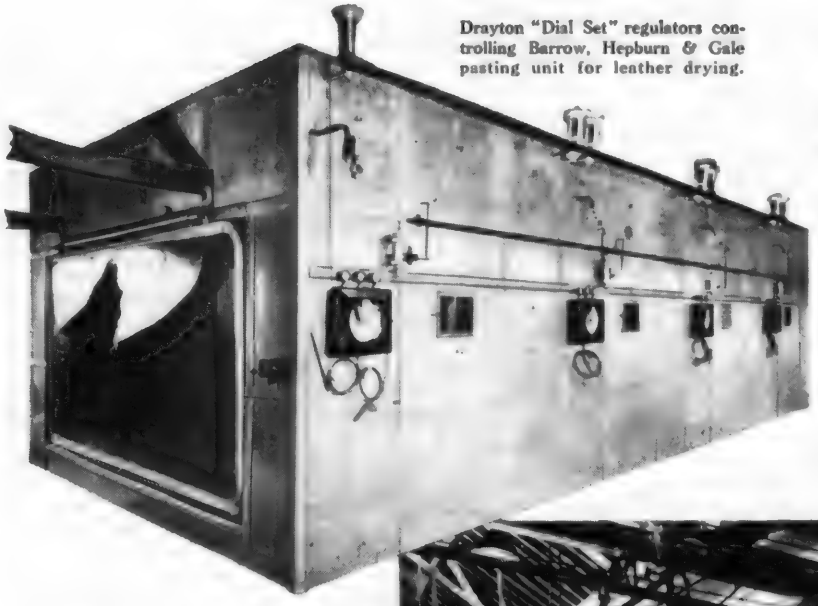

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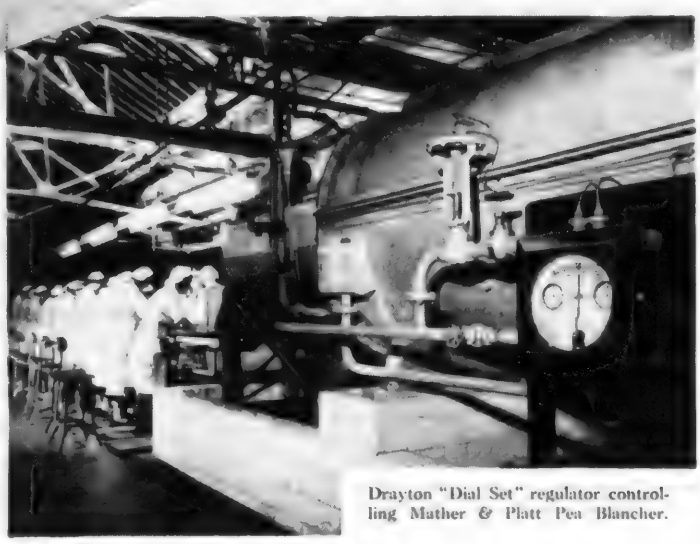
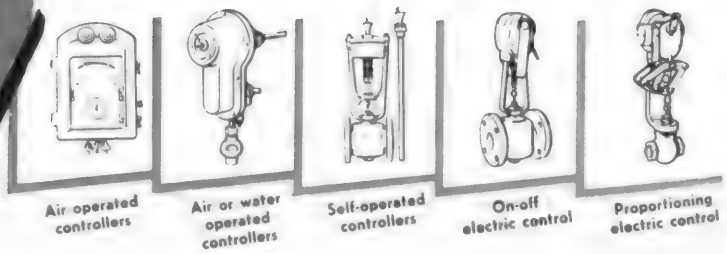


Drayton "Dial Set" regulator controlling Mather & Platt Pea Blancher.

DRAYTON Controls



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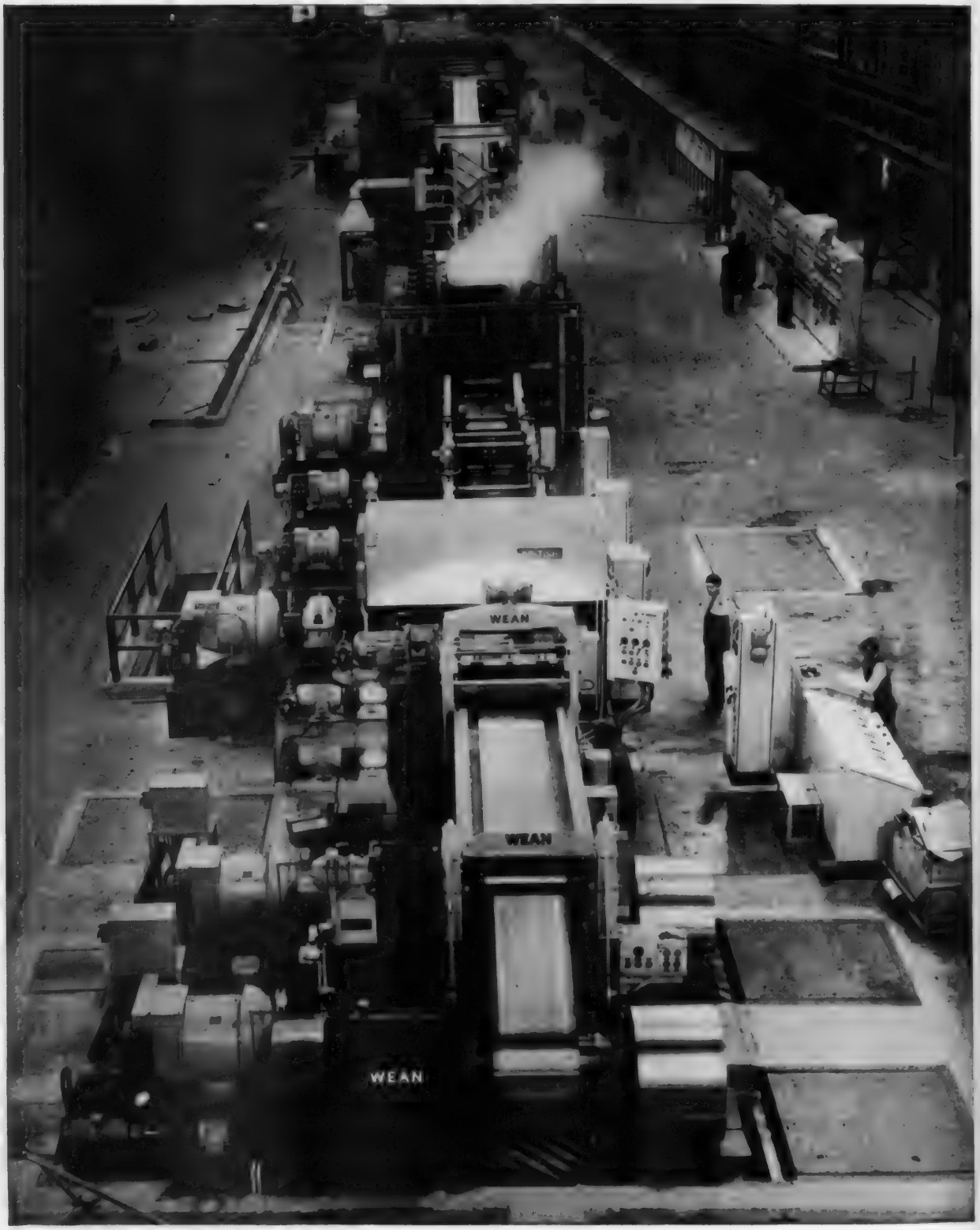

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The species illustrated is the Extended Spindle.

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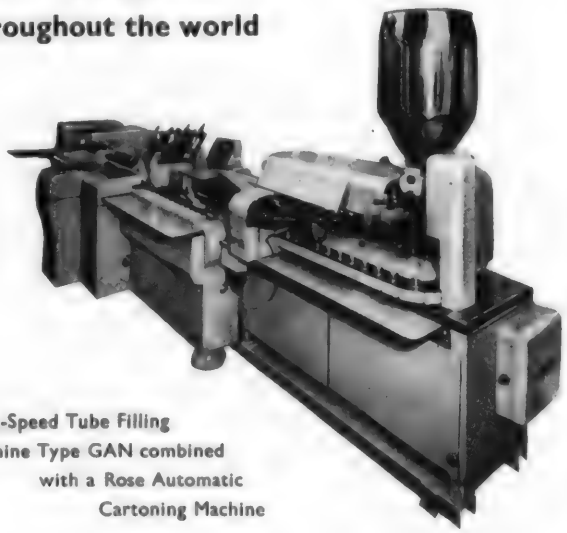

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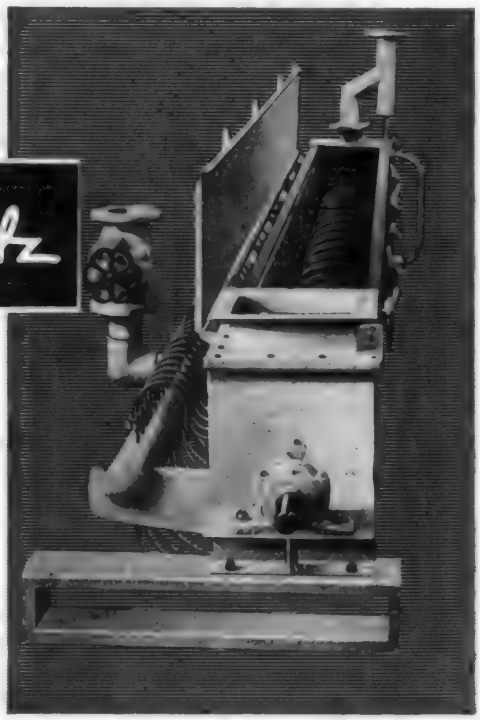

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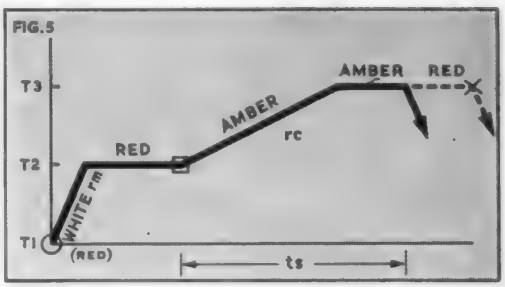

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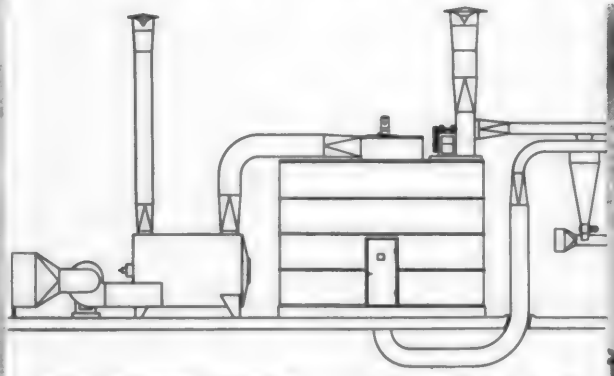

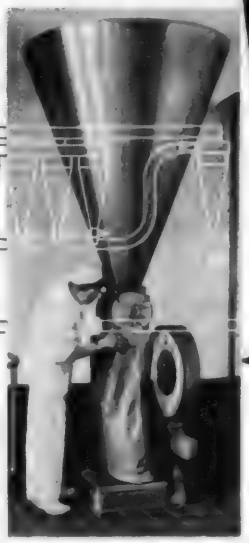

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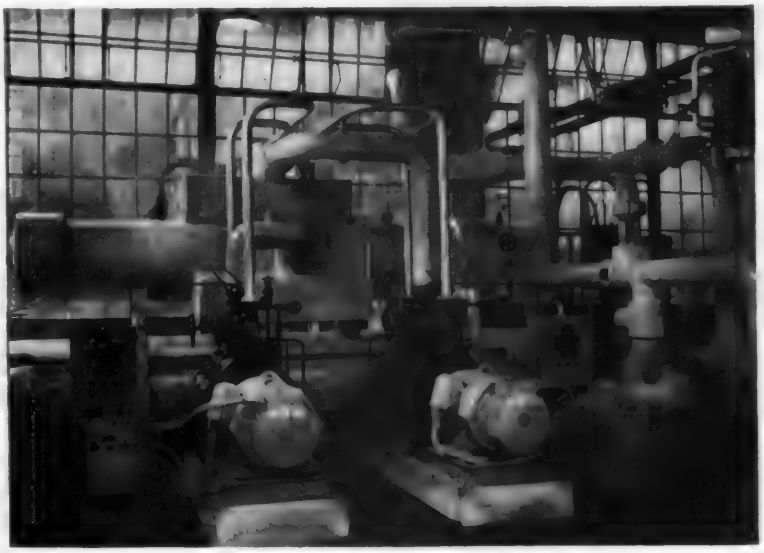

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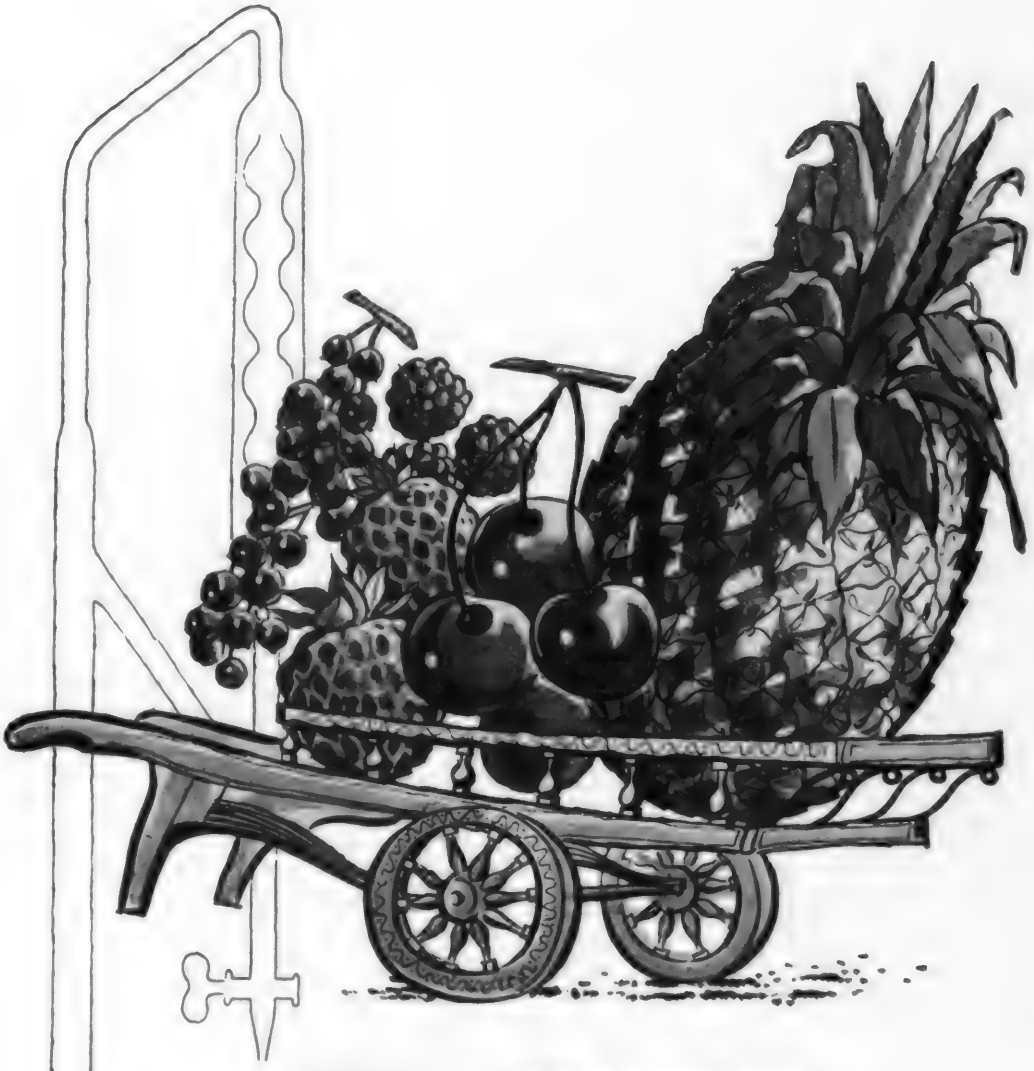

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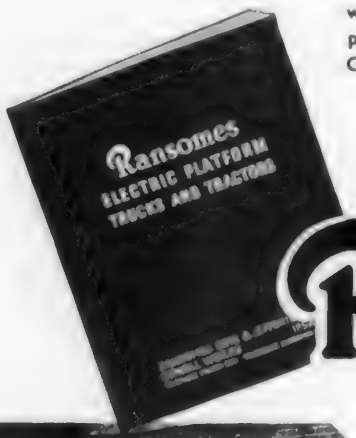

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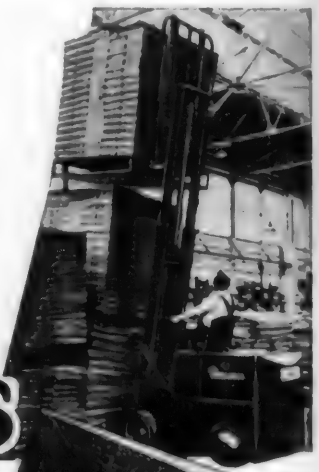

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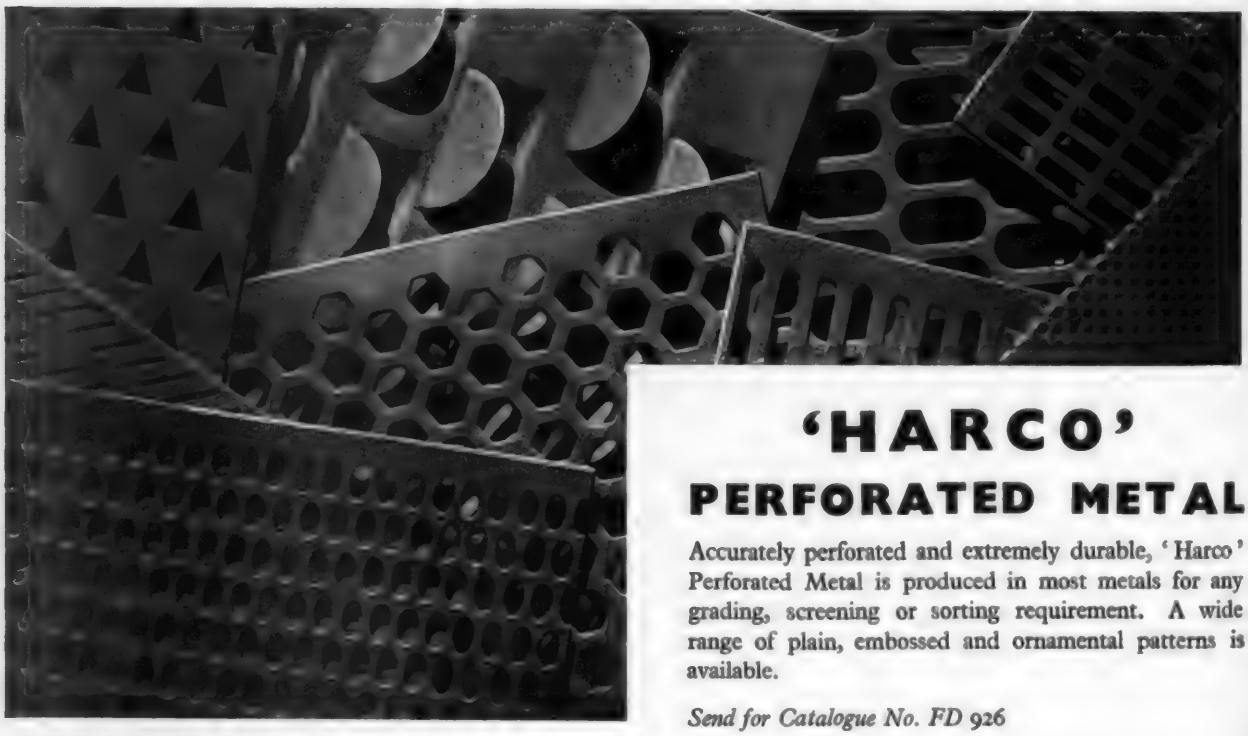

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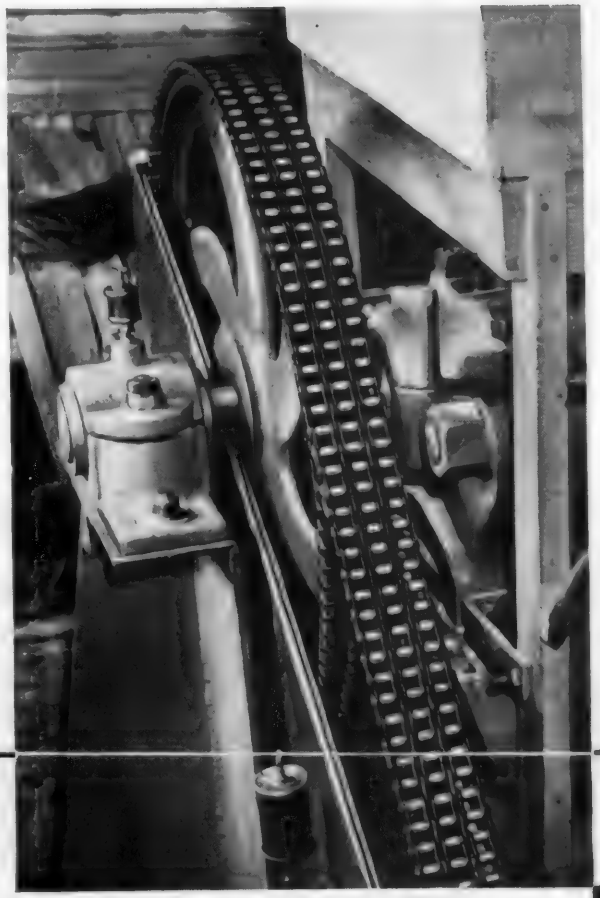

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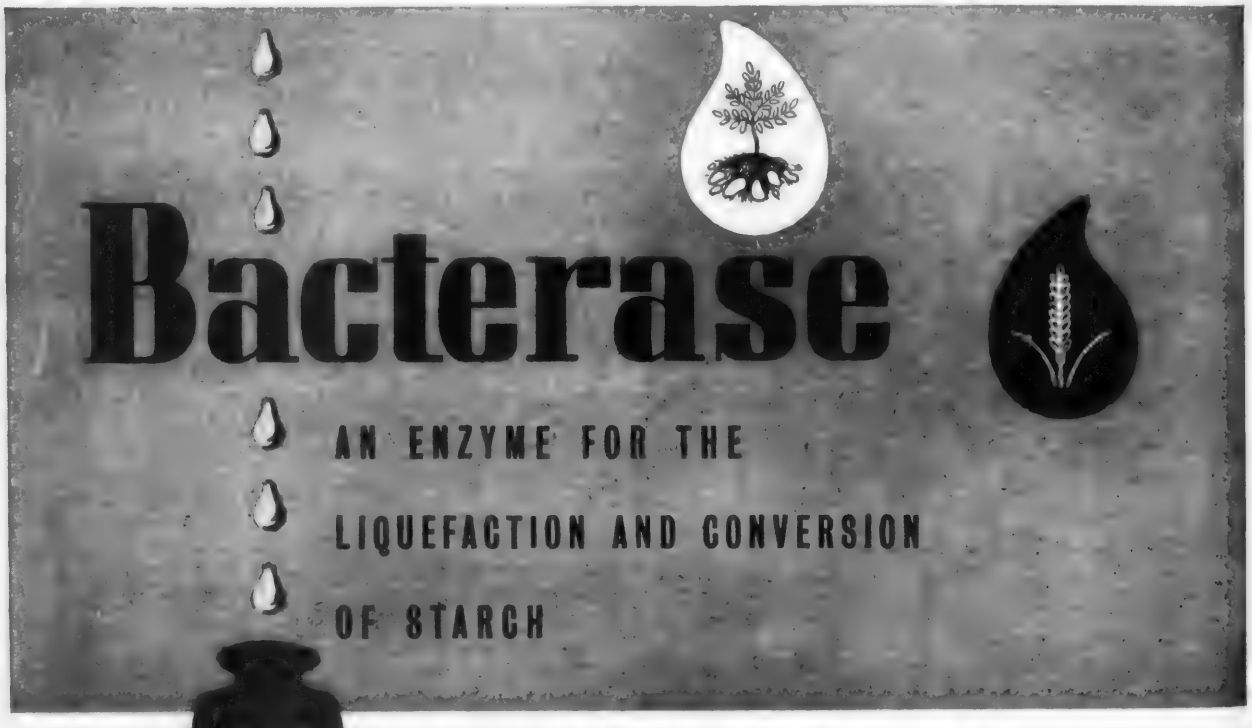

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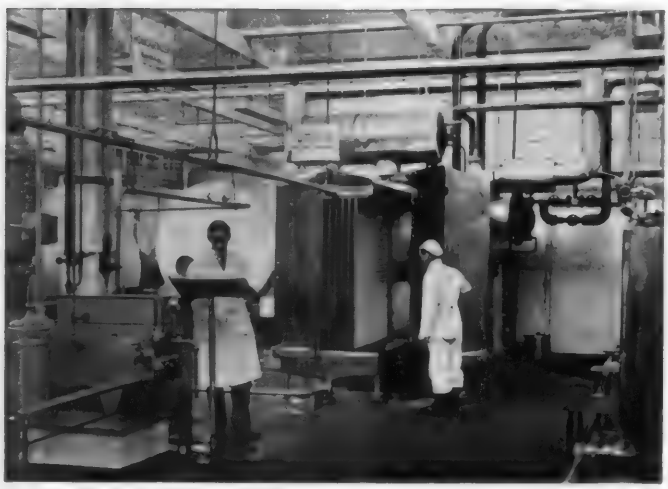

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FOOD MANUFACTURE

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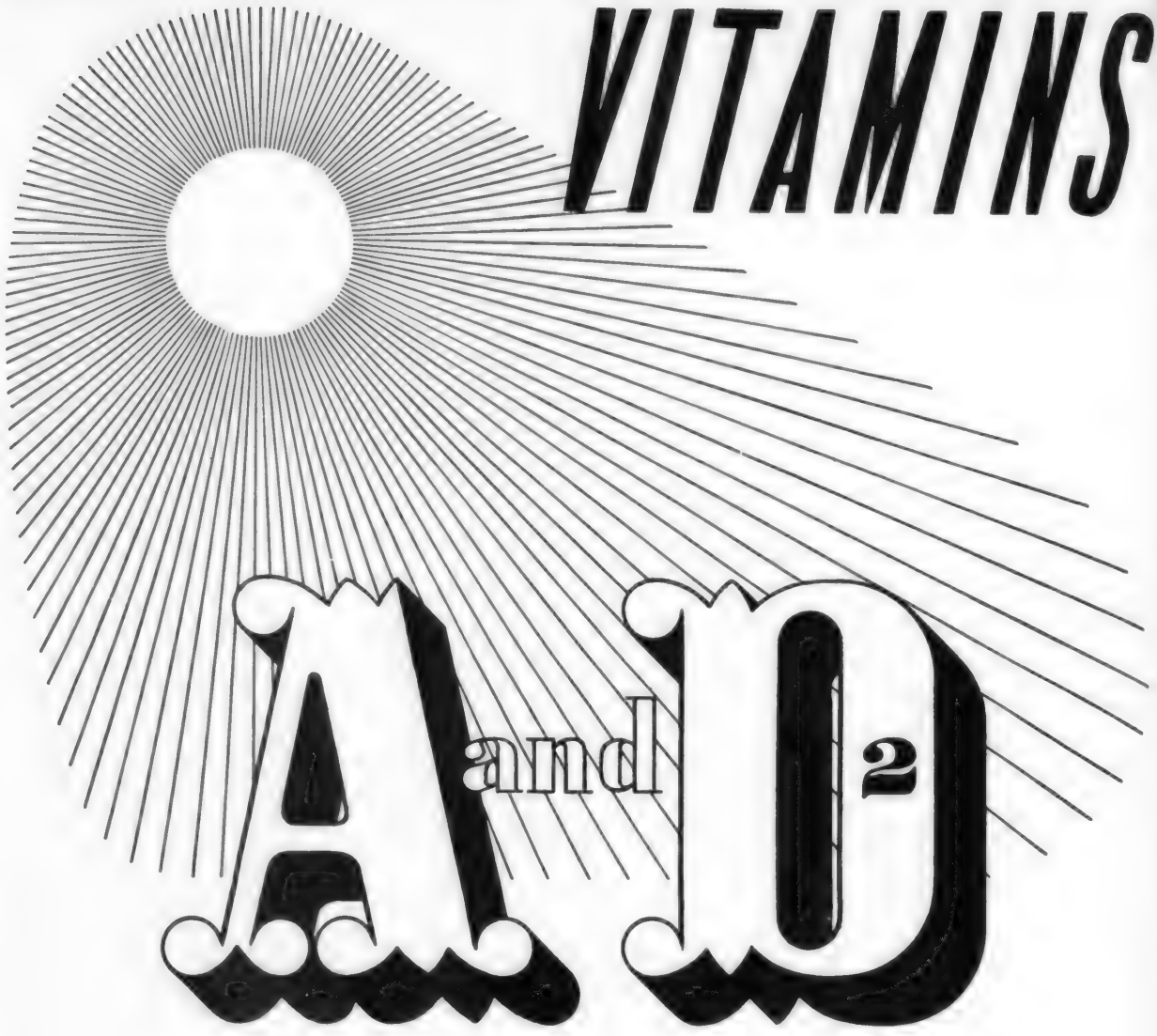

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FOOD MANUFACTURE

Vol. XXXII, No. 9 September 1, 1957

Facts about floors

THE floors of a food factory must resist wear and tear, not only because of the expense of replacement but because worn floors harbour dirt. They must resist the action of the cleaning materials and sterilising agents which have to be used so freely in the food manufacturing industries. Above all, they must in most cases resist the action of water, for there are very few operations in food manufacture which do not involve the use of water, either as an essential ingredient or as a cleaning agent. We are therefore devoting part of this issue to the consideration of floors in the food industry—to their construction, to the choice of flooring materials, and to the maintenance of floors in a clean and sanitary condition.

The subject of floors has grown in importance over recent years to such a degree that there is now a monthly publication devoted to all aspects of their construction, finishing, maintenance, etc. *Floors* is a Leonard Hill publication, and specimen copies can be obtained by writing to the publishers at Stratford House, Eden Street, London, N.W.1.

Regional tastes and appetites

THE nation continues to eat more food. The most recent report of the National Food Survey Committee (*Domestic Food Consumption and Expenditure*, 1955, H.M.S.O., 6s. 6d. net), indicates that although the nutritional composition of the diet was similar in 1955—the first full year after rationing ended—to that of 1954, domestic consumption of meat, fish, butter, and sugar showed some increases. The largest increase was in the consumption of meat, which with a 6% rise reached parity with pre-war figures. The report shows that over the five years from 1950 the general level of retail prices rose by nearly one-third, earnings and food prices by nearly a half, and domestic food expenditure by three-fifths. "The proportion of consumers' total expenditure devoted to food was increasing steadily throughout this period," says the report.

Some interesting facts are also given about regional variations in prices and consumption. It is shown, for instance, that the average level of food prices was highest in Wales and Scotland, especially for fruit, green vegetables, and fish, and (in Scotland) for fresh meat and bacon. The cost per calorie, however, was greatest in London. A marked preference was shown for beef by the Scottish housewife, and this was extended even to sausages, Scotland being the only area where the consumption of beef sausages exceeded that of pork. The consumption of cakes and biscuits was also much higher per head of population in this area than in any other, and the consumption of flour and cooking fats lower. The Scottish housewife appears, more than any other, to have put the days of home-made cakes behind her.

Wales, on the other hand, has the highest consumption of bread and of butter, but, rather oddly in the light of this, one of the lowest consumptions of preserves; clearly the Welshman does not have it with jam on!

Bacteria baffled

IT has long been known that micro-organisms can grow in the absence of liquid water. A high humidity is sufficient, the minimum for growth depending on the organism rather than the substrate. The minimum for moulds (on textiles, leather, grain, etc.) has been shown to vary from 75-90% relative humidity; for bacteria a higher humidity of 90-100% is necessary. From this it follows that materials will not support mould growth provided that "equilibrium humidity," or e.r.h., is below 75%, or bacterial growth if it is below 90%.

A recent paper by Clayson and Blood (*J. Sci. Food Agric.*, 1957, **8**, 404) contributes new data on the above lines, with special reference to the vulnerability of food surfaces to bacterial infection by food poisoning organisms. By an ingenious laboratory technique, thin films of various nutrient materials were brought into equilibrium with a range of relative humidities, and the minimum moisture conditions recorded at which even slow bacterial multiplication could occur. For *Salmonella*, growth was prevented at e.r.h. of 92%; for *Staphylococcus* the figure was slightly lower—85-88%.

Thus when a more or less sterile foodstuff is subject to bacterial contamination only at its surface, the degree of drying off at the surface exerts an important bearing on the possibility of infection.

Additives—expert judgment

THE subject of food additives has again been raised by the publication of a report* by a joint FAO/WHO expert committee on the general principles governing their use. The report adds little which is new to enlightened opinion on this subject, but it may, by virtue of the source from which it emanates, do something to encourage a sorely needed unification of policy among nations in this matter.

The report lays down four circumstances in which "there is technological justification for the use of acceptable food additives to the advantage of the consumer," and four in which "the use of certain food additives is not in the best interest of the consumer and, therefore, should not be permitted." In the former group are placed situations in which the presence of a suitable additive maintains the nutritional quality of the food, enhances its keeping qualities so that wastage is prevented, makes food more attractive to the consumer, or provides some essential aid in the processing of the food. In the second group are placed circumstances in which the presence of an additive might disguise the use of faulty techniques, deceive the customer as to the quality of the food, or result in a decrease in the food's nutritive value, and cases in which the desired effect can be obtained by good manufacturing processes which are economically feasible without such addition. The use of any additive is sanctioned, of course, only where adequate evidence is available of its non-toxicity at the level of intake which its use would entail.

Two important points emerge from this listing of situations in which additives may or may not justifiably be used. In the first place, it is recognised, at least by implication, that where deception is not practised it is advantageous both to manufacturer and consumer to make food more appetising by incorporating colours, etc. This is particularly so in the more primitive communities, where the total amount of food available may be inadequate, and the report mentions that several foods which were previously fed chiefly to animals are now being used increasingly as human food, thanks to the judicious use of flavours, colours, and agents which improve texture.

The second point of importance is that the report admits that even first-rate manufacturing procedures may under certain circumstances so detract from the appearance or other qualities of a foodstuff that the addition of substances such as artificial colour is justified; and that any manufacturing procedure which is held to render the use of additives unnecessary must be economically feasible in the particular circumstances cited. This last point is of particular importance, since it indicates in the Committee an awareness of an aspect of the problem which is frequently neglected. It is often the case that there exists a method of processing or a means of distribution which does not require the use of food additives to bring to the customer a certain commodity. It does require, however, the use only of the highest quality raw materials, and the price of these may be extremely high. If there exists alongside this situation an abundant supply of raw materials which, although of lower quality, are still perfectly wholesome, and a reservoir of customers who have neither the desire nor in some cases the means to pay the higher prices which the first alternative necessitates, the use of appropriate additives would seem entirely justified, in the interest of both the poorer customer and the national economy, notwithstanding the fact that an "alternative" method is available.

In dealing with the safeguards necessary to cover the use of food additives, the report comes down firmly on the side of a permitted list, and sounds a warning on the need for regulating not only the amount of an additive in any particular foodstuff, but also the total amount which is likely to be consumed from all sources. The danger that a permitted list may in certain circumstances lead to vested interests and impede new developments is fully recognised, and it is emphasised that provision must always be made for the inclusion of new materials of superior performance when the non-toxicity of such compounds has been fully established.

* *General Principles Governing the Use of Food Additives.* Report of the Joint FAO/WHO Expert Committee on Food Additives. H.M.S.O. 1s. 6d. net.

Milk, strontium and cancer

THERE are still people who complain bitterly about today's "de-vitalised," pasteurised milk. What these robust souls will think about tomorrow's milk —which is liable to be first de-calcified and then again re-calcified even before the normal processing starts—is anybody's guess.

It seems possible that this procedure will have to be followed to protect us from ingesting enough strontium 90 to cause cancer of the bone. Strontium 90 is a radioactive dust which was practically non-existent until the first atomic bomb was detonated. Now, it is believed, every person in the world has some of it in their bones, though fortunately well below the level at which it might initiate cancer.

Dairy produce has been estimated to contribute four-fifths of the strontium 90 which finds its way into human beings. After every atomic explosion strontium 90 in the fall-out is deposited over the land. Grass-eating animals act as concentrating agents, and the strontium travels with the calcium not only into the bones of animals but into their milk. However, while calcium builds bones, strontium 90 destroys them.

This is a black picture, but we are not entirely

helpless. Very little strontium 90 has settled out so far (the majority will settle over the next 10 to 15 years) and experiments are being conducted over the world to determine whether the amount of strontium which has been released into the atmosphere is higher than the accepted level. According to Dr. J. H. Harley of the U.S. Atomic Energy Commission, the average individual contains 1/10,000th of a microcurie of strontium 90, while the A.E.C.'s permissible level is 1/10th microcurie and the danger level is between 30 to 40 microcuries. If the strontium level does become dangerous the human intake could be reduced by 80 to 90%, according to a report in *New Scientist*, simply by purifying the milk in the same way as calcium is removed from hard waters. By passing the milk through an ion-exchange material all the strontium and calcium are replaced by sodium. The treatment is very cheap, though the calcium would have to be replaced. Those of us who are politically unsophisticated will, of course, want to know if it would not be cheaper and simpler just to stop exploding nuclear bombs.

Another point on which official comment would be welcome concerns the danger to actual milk-bearing animals. After all, there seems little point in ensuring safe milk if all the cows have died.

Fats and fancies

IT has never needed a great deal to be said and written for a particular food or class of foods to become associated in the public mind with a specific disease. This is especially true of diseases which show an alarming tendency to increase in incidence. There is an urgent need for "explanation," for finding a scapegoat—and diet is an obvious hunting-ground. Lately fats have been singled out as causative factors for arterial disorders; American opinion has swung very substantially to the view that too much animal fat in the diet brings bigger risks of coronary or cerebral arterial troubles. This simple "cause-and-effect" thesis is frequently put forward in popular health articles in the U.S. press, and there has been a fall in fats consumption. Yet, according to Dr. P. L. White, secretary of the American Medical Association's council on foods and nutrition, the thesis has never been proved and animal fats may well have been needlessly condemned.

Fats *per se* do not enter the blood stream—they must have a coating of protein put on to them before they can be carried as lipoproteins. It is true that these large fat-protein molecules can sometimes diffuse into artery walls and stay there, building up a "bulge" that may cause restriction of the arterial passage. Whether such a condition is developing is "checked" by measuring the cholesterol level in the blood, but that is only because there is no better test method known. It is no more than an *assumption* that the blood's cholesterol level indicates lipoprotein accumulation in arteries. However, diet tests under strict conditions have shown that animal fats raise the cholesterol level in the blood whereas plant fats lower it. Again, it is an *assumption* that when a normally well-mixed diet is being regularly eaten, these two kinds of fats will still have these different effects. The evidence that animal fats are dangerously connected with arterial diseases is at best, therefore, a chain with missing links.

No one in his senses would wish to discourage progress in the battle to reduce the modern mortality rate of heart diseases—on the other hand, it is not progress at all if in fact the wrong scapegoat is receiving most of the attention. Dr. White's scepticism at least deserves some of that attention too.

Sales psychology

A NEW weapon is being brought to bear on the problem of consumer preference. Known as motivation research, the new technique seeks to account for the often illogical preferences of housewives and other purchasers. Conventional market research aims at gaining information about consumer preferences by questioning a representative group of potential customers. Unfortunately, having expressed a preference for a particular type of commodity, these potential customers may then obstinately refuse to buy it when it is marketed. Motivation research seeks to find out why.

According to an article in the *Financial Times*, research along new lines began as a result of experiments by a Chicago psychologist. A group of American housewives were each given three packets of soap powder to test—one coloured yellow, one blue, and one blue and yellow. The contents were identical. Most housewives said that the powder in the yellow packet was too harsh, and harmed their clothes; that the powder in the blue packet did not clean their clothes effectively; and that the powder in the striped packet was entirely satisfactory.

It may be thought that such illogicality could not extend to the choice of foods, but apparently it does. The article cites a case in which housewives attributed laziness, inefficiency, and poor motherhood to one of their number expressing a preference for instant coffee. The manufacturers were therefore advised to stress the flavour value of their product rather than the speed at which it could be prepared.

In another example quoted, the California Fruit Marketing Association found by means of word-association tests that most people associated prunes with unpleasant responses. The result was a campaign in which prunes were re-named "California's new wonder fruit."

Welfare food doubts

DOUBTS on the value of orange juice in the welfare foods scheme have been expressed several times, and it is nearly three years now since Ministry of Health experts showed that the product, issued to supply extra vitamin C to children, in fact constitutes merely a pleasant drink. Now a recommendation has been made—one of several by a sub-committee of the Standing Medical Advisory Committees of the Central and Scottish Health Services Councils*—that welfare orange juice should no longer be supplied to children after their second birthday.

"Scurvy," says the committee, "is virtually non-existent after that age," and there is no firm evidence to show that a wide margin of vitamin C is required beyond that which is fully adequate to prevent scurvy. The committee came to the conclusion that children over two receive sufficient vitamin C from their varied diet and that the provision of orange juice for children two to five years old is "an insurance against a contingency which the available evidence suggests does not exist." Two of the 14 strong committee, however, disagree with this conclusion, and believe that the continuation of the present provision up to the age of five is desirable. They hold that there may be impaired growth and development or other ill-effects associated with low vitamin C intake.

The sub-committee also recommends that national cod liver oil should continue to be provided up to the age of five because rickets does occasionally occur in this age group, but considers that the vitamin D content should be reduced from the present level of about 800 international units per teaspoonful to 400 i.u. Vitamin D should continue to be supplied in National Dried Milk, but the level of fortification should be reduced from 280 i.u. to 90-100 i.u per oz. of dry powder. The committee also thinks it desirable that the level of vitamin D in infant cereals should be reduced to an average of 300 i.u. per oz. instead of up to 1,000 i.u. as at present. The committee considers it important that doctors, maternity and child welfare officers and health visitors to whom mothers look for guidance should be fully aware of the amount of vitamin D contained in the many sources which may be used.

They consider that to maintain the health of expectant and nursing mothers at the highest level the supply to them of welfare orange juice and vitamin A and D tablets should be continued.

A final recommendation is that in view of the low uptake of welfare foods supplements, the possibility of improving the present distribution arrangements should be kept under review both by the Government departments concerned and the local authorities.

* *Report of the Joint Sub-Committee on Welfare Foods*, H.M.S.O., 2s. net.

Selling the Americans

THE growing importance of the U.S. market to British food manufacturers and exporters is hardly to be wondered at. The richest country in the world has over 170 million inhabitants who have an average income which is more than twice that in the U.K. Exports are rising and British foods are generally popular. Sales of speciality foods rose from £1·1 million in 1950 to £6·3 million in 1956. Whisky sales in 1950 were worth £16·7 million; in 1956 they had risen to £25·5 million.

Yet in spite of its position of pre-eminence there is a good deal of hesitation among potential exporters about tackling the American market. It has a reputation for being chancy, difficult to penetrate and liable to sudden tariff increases. To help and encourage the potential exporter the U.S. Department of Commerce has published a booklet* now available in the U.K., and this has been backed up by recommendations and suggestions by officers of the British Consulate-General in New York.

Practically the only way for a British manufacturer to enter the American market is piecemeal—one area or one group at a time. Many now large American firms started in this way, and even today the largest firms try out a new product in a test area in order to keep down promotion costs while the possibilities of the product are assessed. Other manufacturers "skim the cream" by selling only in markets where sales are most easily secured. For example, 282 of America's 3,070 counties contain nearly 58% of the population of the country, nearly 70% of its buying power and 67% of its retail sales.

Diversity in the American market is to be expected. The East and Middle West still tend to be conservative, whereas West Coast taste is more modern, informal and unconventional. Flavour preferences vary; in the east cola drinks have 40% of the total soft drinks market, in the south more than 85%. In the Pacific states ginger ale has 8%, in the north-east 28%.

Food preferences are strongly affected by differing ethnic backgrounds. German, Polish and Scandinavian origins are strong in much of the Middle West, Spanish in California and French in parts of the south. New York is, of course, in a class by itself with some 4½ million of its inhabitants either foreign-born or of foreign or mixed parentage. Four-fifths of the sales of Scotch whisky and half the British sales of speciality foods go to the north-eastern states, but New Englanders, more familiar with Europe, may be less impressed by an "imported from Britain" label, if not backed by quality, than would some less sophisticated communities.

* *Selling the United States Market*, U.S. Dept. of Commerce, H.M.S.O., 9s. net.

ANIMAL FEEDS
Production for a Fast-Growing Market

In a few years the market for animal feeds has grown enormously. "Food Manufacture" went to Southall, Middlesex to see how Quaker Oats Ltd., tackle the manufacture of 82 different products for pigs and poultry

THE methods used by the Ful-O-Pep Feeds Manufacturing Division of Quaker Oats, Ltd., to produce their range of pig and poultry feeds are centred on the maintenance of high-quality standards. Quality control inspectors are on duty during all shifts at the Southall Mill to examine each of the 82 products at every stage of its manufacture. The feeds themselves have been formulated with the utmost regard to their nutritive value and palatability, each product having a specific job to do in the feeding of livestock.

In most civilised countries the manufacture and sale of animal feeds is subject to legislation. In Britain the vendor of compound animal feeds must, under the Fertilisers and Feedingstuffs Act, declare percentages of protein, oil and fibre that are present in each feed. These regulations, however, do not themselves guarantee quality, and in the highly competitive market that exists in this country today the modern animal feed compounder, by careful research and by following all the latest developments in animal feeding, must ensure that the feeds produced will give the best possible result when fed to livestock on the nation's farms.

Above: **Bags filled with pig and poultry feed are unloaded from a roller conveyor for storage prior to despatch.**

Raw materials

The market for animal feeds has grown enormously in the past few years. The agricultural industry of Britain is largely composed of small farms each carrying a relatively small number of livestock, and it would not be financially sound for the farmers to attempt the scientific preparation of modern animal feeds. The raw materials used in the feed compounding industry are many and varied. Cereal grains, and offals of the flour milling industry form the basis of most feeds. These, when carefully blended with animal and vegetable proteins and all known essential minerals and vitamins, give the balanced diet required

The Ful-O-Pep division's 10-storey production building, showing some of the 100 ft. concrete silos. Raw materials are arriving by rail in the foreground.

for speedy growth and heavy production. For every hundred tons of finished product that are despatched from the Southall Mill a similar quantity of raw materials must be handled and stored. The number and complexity of the raw materials involved make this a considerable problem. These raw materials may be purchased in anything from 1 cwt. to 1,000 ton lots. Suitable arrangements, therefore, have to be made to deal with a daily intake of several hundred tons.

Materials arrive at the mill either by rail, road or barge. Road and rail consignments all cross the weighbridge on entering the premises, and after this weight check the consignment is inspected for quality. Firstly a visual inspection is made in order to ensure the materials are free from any of the numerous insect pests connected with the milling industry. On rare occasions when a load is found to be infested it is either rejected or unloaded direct into the fumigation chamber for either heat or gas fumigation. This routine visual inspection also includes checking for the presence of mould on cereal grain and the presence of impurities such as weed seeds and straw.

Assuming that the raw material has passed this visual inspection, it is unloaded and samples are taken to the laboratory for routine analysis and comparison with control samples. The bushel weight and moisture content of cereal grains are determined on the spot. The former, as its name implies, is the weight of a given volume, in this case a bushel of the grain. This to some extent determines quality—poor quality oats, for example, having an extremely low bushel weight.

Ingredients are mixed in this battery of proportioning machines.

Storage

Most of the raw materials are stored in bulk. This includes all the cereal grains, vegetable protein and some of the wheat offals. The remainder are unloaded on to pallet boards and stacked by means of battery-driven fork-lift trucks. The silos which provide the storage space for the bulk raw materials form part of and adjoin the ten-story production building. Each silo consists of 100 ft. tall concrete storage bins, each of which holds in the region of 320 tons of wheat. Some of these bins are divided and sub-divided for materials in smaller quantities. The danger of grain becoming overheated during storage owing to high moisture contents is overcome by a temperature control system showing the grain temperature at different bin levels. Rope thermometers with points at every 10 ft. are suspended from the centre of each of the main bins. Each thermometer is electrically connected to a control switchboard situated in the silo office. Routine temperature readings are taken each day; from these it is possible to judge how the grain is behaving in bulk storage. All bins are provided with an exhaust system, and every time they are emptied routine cleaning and fumigation is carried out.

The whole building is of comparatively recent construction, and some parts of it were built only eighteen months ago. The two silo blocks have been sited so that they may eventually become joined. The concentration of weight of a large quantity of grain together with the weight of the silo structure on a relatively small area is bound to result in subsidence. When both buildings have reached their final level the union of the two will be a comparatively simple matter. The production plant is situated on all the floors of the building and the operators

may pass from one floor to another by means of a man-lift. This is an endless vertical belt conveyor provided with platforms and hand grips. It is in constant motion and a man wishing to go up or down merely stands on the platform and gets off at the appropriate floor.

Cleaning

Raw materials destined for the silos are, on arrival at the unloading bank, tipped into one of several grid-covered hoppers situated there. They are removed by horizontal 75 ton chain link conveyors sited in the basement and are carried forward directly to the boot of one of the 75 ton bucket elevators. These elevators carry the material right up to the top of the building and in the case of grains these fall by gravity to the ninth floor for preliminary cleaning. This initial cleaning is carried out in a battery of scalperators. Here, any large impurities which may occur are removed and deposited at the base of the machine. During this process the grain is aspirated. All the scalperators are connected to a central exhaust system. The grain, now free of the inevitable debris, is discharged on the eighth floor into horizontal conveyors situated over the lines of storage bins. A similar set of conveyors is found below the bins, and by means of these and the elevators raw materials can be discharged into, or transferred from, any one of the 100 silo bins. In order to keep a constant check on the contents of every bin the silo operator records on a large blackboard the quantity and type of material put into each.

Large impurities are removed from grain by scalperators.

The contents of every bin are recorded on this blackboard on the eighth floor. On the right are horizontal conveyors.

As can be seen from the above, the intake system of a large proportion of the raw materials consists of gravity discharge into horizontal conveyors and the elevation and further conveying which finally deposits the material in its appropriate storage space. One major exception to this system is the intake of grain imported from several foreign countries which arrives at Southall by water. These grains are unloaded at the London Docks into canal barges, each of which carries about 90 tons. The barges are towed inland, first of all up the Thames and then by smaller waterways to the mill where they are unloaded by suction pump. This grain is sucked out of the craft, weighed and deposited eventually in the boot of one of the elevators, to be carried upwards for cleaning and storage.

Processing

For convenience, raw materials can be divided under two broad headings: (*a*) those which have to be ground, (*b*) those which can be introduced directly into the mixture without further processing.

To deal with (*a*) first, in this category are all the cereal grains, maize, wheat, barley, oats. Prior to grinding, the main cereals are blended in the required proportion and turned into the silo bins directly above the grinders. The exception to this is oats, which is ground separately. The grinding of these materials occurs directly prior to mixing. Each grinder is supplied direct from the silo bin above it and the resulting meal is passed to surge-tanks fitted above the mixer feeders. The

Left: **Mash tanks on the sixth floor provide the feed for the pellet presses on the floor below.** *Above:* **One of the pellet presses used to produce animal feeds in crumb, pellet and nut form.**

operation carried out by the grinders is as follows: loosely slung hammers suspended on the periphery of a rotor and turning fast, smash and pulverise the material being fed into it. This fine material passes through a screen of given diameter and is drawn up by means of a strong fan to the cyclone situated on the floor above. The majority of the particles fall, passing through a seal and on by a system of worm conveyers to the mixer surge-tanks. The air involved passes out through long textile sleeves which trap the finer particles of dust still remaining suspended in it. (*b*) The materials which do not require grinding, *i.e.* the wheat offals, dried grass meal, extracted soya bean meal and sterilised steamed bone flour, are all supplied direct to other surge-tanks situated above mixer feeders.

The remainder of the raw materials, the animal proteins, minerals and vitamins, are pre-mixed together to ensure that every bag of the finished product which leaves the mill has the correct percentage of each essential ingredient. After this initial pre-mixing, this section of the raw materials is now deposited in yet another surge-tank above a mixer feeder.

The mixer feeders are set up in such a way that they all discharge a given quantity of the raw material from the surge-tank above them, so that each mixture contains the required percentage. Each mixer surge-tank is fitted with an electronic controller so that should the supply of raw material to any one tank run out, all the mixer feeders are immediately stopped. In addition, the output of each feeder is checked at regular intervals during every production run by the shift quality control inspector to ensure that it is accurate.

The mixer feeders are sited above a large worm conveyor which carries the raw materials in their partially mixed state to an elevator, which in turn transports the mixture back to the top of the building. From the elevator the mash falls to a long blending worm on the eighth floor. This blending worm feeds the mash into lump-breakers which, as their name implies, will break up any small lumps remaining in the mash. Above these lump-breakers are beds of strong permanent magnets which will remove any metal that may bave been introduced in any of the raw materials.

The mash falls from the lump-breakers and is conveyed by worm conveyors to two Locker Rotex oscillating screens. The framework of these screens consists of two rectangular wire mesh sections, placed together to enclose a space between them. Slats between these wire mesh screens turn the space into a series of compartments, each of which holds a hard rubber ball. While the screens rotate the mash contained in the compartments passes through the screens, the rubber balls preventing any blocking. Any impurities remaining in the mash are ejected, and the fully mixed clean mash continues on its way through the various sections of the production plant.

At this point it may be diverted either to the pelleting machinery or may pass directly on to the mash weighers and packers.

On the sixth floor the mash destined for pellet production is deposited by means of worm conveyors into six large surge-tanks, each of which is directly above a pellet press on the floor below. The function of these tanks is to provide a reserve of feed to keep the presses constantly operating.

In recent years in the pig and poultry industry there has been a big increase in the use of feeds in crumb, pellet and nut form. Crumbs are produced for baby turkeys, chicks and the broiler industry, $\frac{1}{8}$ in. diameter "growing size" pellets for growing stock, 3/16 in. diameter, adult poultry pellets, and $\frac{1}{2}$ in. pig nuts. Mash from the surge-tank is injected with steam and forced by rollers

Three-ply paper bags are filled with pig and poultry feed and conveyed to the automatic stitching machine.

through a revolving die, the pellets and nuts being cut to their required length by fixed knives. Immediately after production the pellets have to be cooled rapidly to prevent them from breaking up. On the fourth floor below each press, a cooler equipped with probe temperature recorder reduces the temperature of the pellets quickly to a safe level.

Crumbs are produced from 3/16 in. diameter pellets, which are passed through fluted crumbing rolls situated below the cooler seals. These rolls reduce the pellets to the required crumb size.

Packaging

. On the third floor directly below the coolers are rotating screens which remove undersized pellets and dust and recirculate them to the press surge-tanks for reprocessing. Also on this floor are the two weighers for that part of the mixture which is not to be pelleted. These are fed by a large surge-tank on the floor above which provides the weighers with a constant supply. Both mash and pellets are packed on the second floor of the mill. With one exception all products are packed in 56-lb. units in 3-ply paper bags. These are clean, non-returnable and highly coloured and are in themselves an excellent advertising medium. They bear the name of the feed together with a list of the ingredients used, simple instructions on how the feed should be fed, the declared analysis and a code number which allows the manufacturers to trace back the origin of the feed, date of production, and the raw materials used should they require to do so.

One feed, Ful-O-Pep pig concentrate, is also sacked in 1-cwt. units in hessian sacks for the convenience of the agricultural merchants.

All the filled bags are stitched mechanically and pass from the stitcher to a long belt conveyor and on to the warehouse for storage prior to despatch.

Sugar and Capitalism

"We are not organised for book production and our skills do not lie in that direction," says Sir Edward Knox, chairman of the Colonial Sugar Refining Co., Ltd., in his introduction to a recently published history* of the company. Sir Edward is too modest. He and his co-authors have produced a highly interesting and well presented account of the growth of the company and of its activities in Australia, New Zealand, and Fiji. The book aims to do more, however, than give a simple account of the growth of the sugar industry in these areas. It aims also to show the motives which actuate a big business, the type of people who own the business, and the rewards that accrue from capitalistic enterprise.

The book will appeal to many types of reader. It will interest the botanist and agriculturist by the account which it gives of the sugar cane plant and of the systems of crop rotation under which it is grown; for the food technologist, there is a full account of the methods by which the raw sugar is extracted from the cane and subsequently refined; whilst anyone interested in general factory management and staff organisation will find a most useful account of the company's experiences in these fields.

It is in its treatment of business transactions at a higher level, however, that the book really comes into its own. It deals at length with the financing of the operations of this company in particular and of the sugar industry as a whole, and with the effects upon the industry of such factors as market fluctuations, inflation, and domestic and international monetary policy. On a more general level, a chapter is devoted to examining the role of corporate capitalism in a mixed economy. The accountant, the economist, and the general businessman will therefore also find much to interest them in this work.

* *South Pacific Enterprise.* By the Colonial Sugar Refining Co., Ltd., 1956. Angus and Robertson, Sydney and London. Pp. 500+xvii. Illus. 45s. net.

Leaf Protein as a Human Food

By N. W. Pirie, F.R.S.*

At Rothamsted Experimental Station, Mr. Pirie and his colleagues have made leaf protein and tried it in various food products. They have eaten it and found it an acceptable food. They are anxious for the food industry to take an interest in this new food and offer experimental supplies to anyone likely to find a use for it. Here Mr. Pirie describes how leaf protein is extracted in the specially-designed machinery at Rothamsted, discusses its nutritive value and outlines future research objectives.

ONE hundred and eighty-four years ago leaf protein was prepared and its resemblance to casein noticed; thirty years ago the possibilities of using it as human food were recognised; eighteen years ago co-ordinated work on the bulk separation of leaf protein started. But the protein is not yet in use. There are many reasons for this delayed appreciation of a new source of food. Some people, misled by the presence of unsold surpluses of food in a few countries, do not realise that there is a world food shortage and that as medical services and hygiene improve it will get greater. They confuse effective demand with need. The need is demonstrated in graphs published by the Food and Agriculture Organisation,[1] which show that for all foodstuffs the discrepancy between the food consumptions of the better and the worse fed communities in the world is greater now than before the war, and that this discrepancy is particularly great for protein. Other people admit that there is an immediate and increasing need, and that apparently surplus commodities such as dried milk would soon disappear if they could be distributed; but they argue that there are better ways of meeting the need—fisheries, soya bean, sunflower seed, sesame seed, ground nuts, yeast cultivation, etc. All these are valuable and research on their increased production should be pushed forward; but the world is large and very varied, and there are areas where leafy crops grow more readily than anything else. Furthermore, it is easiest to make a balanced diet when raw materials of several different types are available.

Table I.

Pulped green leaves are separated into:

Juice, which gives after coagulation	coagulum containing	proteins, fats, starch	food for man and other non-ruminants.
	fluid containing	amino acids, amides, sugars, salts, etc.	medium for the growth of micro-organisms.
Fibrous residue containing	most of the	cellulose, hemicelluloses, lignins, pectin	still a fodder for ruminants and a substrate for microbial fermentation.
	some of the	proteins, fats, starch	

Leaves: The largest crop

Leaves, in the form of grass, are the largest single crop in Britain. Their value is recognised, but they are fed to animals. Animal conversion is convenient and most people relish the change in flavour and texture that the animal brings about; but these advantages are gained at the expense of very heavy losses. This is the fundamental point of the case for using leaf protein. Mechanical separation of the components of leaves, even if it is not complete, gives us without loss fractions adapted for feeding people or other non-ruminants, and residues that can still be used as cattle feed or as microbial culture media.

Table I sets out the outline of the separation. The case for leaf protein, in a country like Britain, depends on the greater return of protein per acre that should be attainable by this than by any other means, and on our assessment of the probability that this high return will be needed. In war-time the probability was admitted and so most attention was given to that aspect of the case.[2] The uncertainty was not about the advantages of having a home grown source of protein but about whether the research and development could be done quickly enough to be of any value. People were clear enough about what ought to be done; the only problem was to do it.

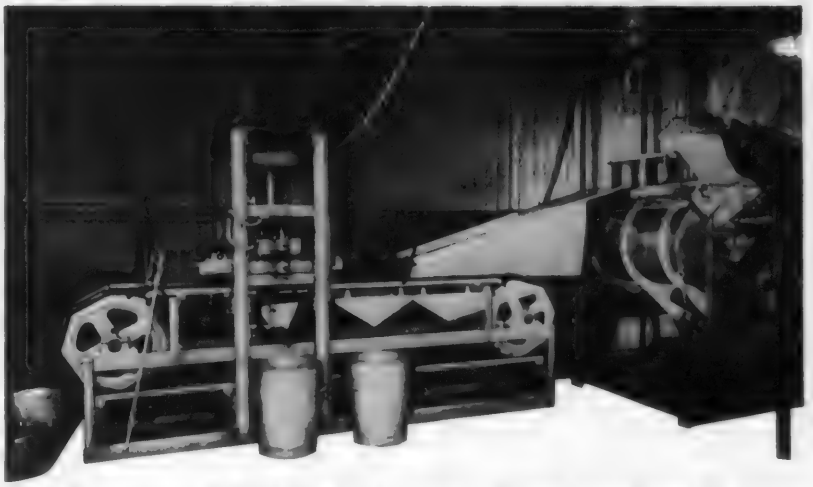
Extraction machinery

During the last ten years some progress has been made, and this has been described in a series of papers.[3, 4, 5] We now have a unit at Rothamsted that can handle green material at rates of from 0·5-2·0 tons per hr., and we have equipment for separating the protein and getting it into a useable state. The photographs show the general arrangement of the pulper and continuous press. The leaf juice runs out from the latter bringing with it about one-third of the protein that was in the leaf, and a further equal quantity can generally be extracted by repeating the pulping and pressing, this

* Head of Biochemistry Dept., Rothamsted Experimental Station.

time with the addition of water. The protein is coagulated by raising the temperature of the juice quickly to 70-80°C., and it is then filtered off and washed.

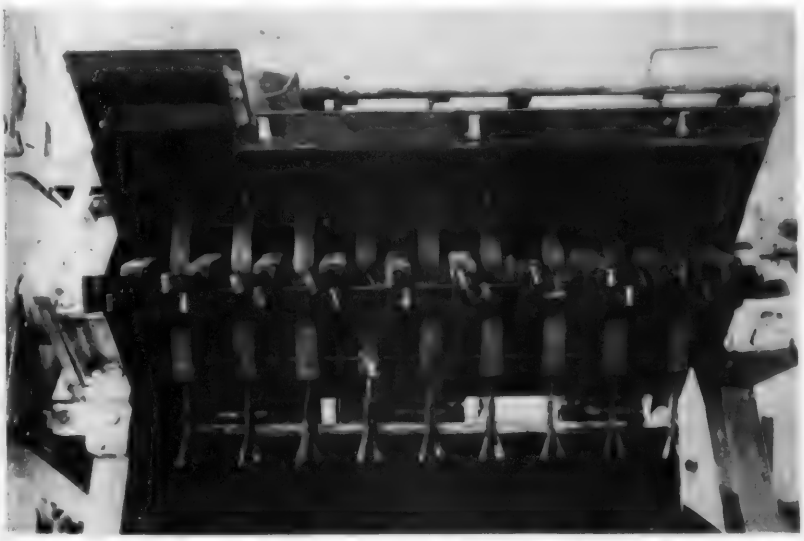
The pulper and press were specially designed to handle material with the texture and composition of leaves because we have not found any existing machinery satisfactory. Ultimately we hope to make a single unit that will pulp and press in one operation, but the two-unit arrangement allows us to study independently the essentially different operations of pulping and pressing, and the conditions of pulping and pressing can be varied widely to suit the varied texture and composition of the raw material. Some effects of this on running efficiency have already been published.[5] The protein is filtered off and pressed by standard processes for which normal equipment is well adapted. No difficulties are encountered in handling most leaves, but a few species, for example comfrey (*Symphytum*) and sweet potato (*Ipomoea*), contain so much mucilage that the leaf extracts are difficult to handle.



General arrangement of the extraction machinery. Fresh leaves from the elevator on the extreme right drop into the hopper and from it pass into the barrel of the pulper. The pulp is thrown out under the cowl of the press having passed axially along inside the barrel. A hydraulic cylinder, which can be seen just to the left of the centre of the picture, applies pressure to the ram and then lifts it. During the lifting stroke the perforated belt carrying the the pulp is moved forward. This whole action is automatic.

Processing

At this stage the protein can be pressed into blocks which contain about 60% of water. They can easily be crumbled. Taking round figures: 1 ton of fresh leaf containing 82% of water contains 400 lb. of dry matter; this should contain at least 80 lb. of protein of which more than half can be extracted. The yield of moist protein cake at this stage is therefore about 100 lb. The protein carries with it 5-10% of starch, from which it could probably only be separated by the digestion of one or other component, and 5-10% of lipids, including chlorophyll. While damp it naturally putrefies easily; even when dry the fat goes rancid on prolonged storage in air. It can be preserved indefinitely under refrigeration, and it seems to keep satisfactorily in the presence of disinfectants or canned after sterilisation by heat. These last two techniques have not yet been adequately studied.



The inside of the pulper. The beaters are of two types, some are set with their faces parallel with the direction of movement and some are twisted. By varying the ratio of these two types of beater and the speed of the pulper a suitable amount of leaf disintegration can be achieved.

Direct drying, either in air at room temperature or on heated rollers, produces a hard granular material that becomes more attractive when again ground finely, although it remains somewhat indigestible *in vitro*. Freeze drying gives a much better product, but this technique is not easily adapted to large-scale production. To get material that can be kept in air at room temperature we therefore extract with acetone and so remove water and lipids successively in one operation. After exhaustive extraction the protein has an only slightly smaller bulk, but it now contains acetone in place of water, and this cannot be removed completely by pressing or centrifuging. The final texture depends on the conditions under which the acetone is removed; if it is driven off at its boiling point the protein again becomes hard and granular, but if it is taken off in a moderate vacuum, with a heat inflow only just sufficient to sup-

ply the small latent heat of vaporisation of acetone, it keeps a light, open texture. Depending on the plant species from which the protein was made, its colour varies from nearly white to fawn or pale brown and it is nearly tasteless.

Nutritive value

The nutritive value of a protein depends on many factors. Prominent among them are the ratio in which the different amino acids occur in it and its digestibility; each of these depends on the treatment to which the protein has been subjected. The value of a protein is not therefore something that can be looked up in tables with confidence; when feeding tests on a protein suggest that it has a high value it is important to remember that it might be difficult to replicate on a large scale the preparative conditions used in making the batch tested. Similarly a batch may have a low value because of inept preparation. The most complete analyses that have been published are on the unfractionated leaf protein and the protein of the leaf cytoplasm of barley.[6] There was very little difference between them; the four amino acids that most commonly limit the feeding value of proteins—cyst(e)ine, lysine, methionine and tryptophan—contributed 0·9, 6·5-7·1, 1·3-1·4, and 1·8-2·0% of the nitrogen respectively. Protein concentrates and leaf meals from a very wide range of plant species have been analysed for a few amino acids and, bearing in mind the untrustworthiness of many analyses on proteins accompanied by large amounts of carbohydrate, the values agree well with these. It seems safe to conclude, therefore, that a product of similar composition will be made whatever the leaf used and whatever the completeness of protein extraction. This is not altogether surprising when we remember that leaf protein is a mixture of a very large number of different proteins, all presumably having different compositions. Statistics therefore come to our aid and smooth out the differences that probably exist between the individual proteins. For the same reason it is unlikely that the same amino acid deficiency will run through all the component proteins and so produce an acute deficiency in any one amino acid in the bulk preparation.

Specific amino acid deficiencies are common in seed proteins, which are made up from a smaller number of individual component proteins, and this has led to the widespread illusion that proteins of animal origin are necessarily better than any proteins of vegetable origin. These issues have been discussed fully in an earlier paper.[7] Furthermore, the whole protein of a real diet would never come from a single source. The manner in which each component protein complements the others is therefore of as much importance as the composition of each separately. Thus, leaf proteins are not rich in methionine, but this would not matter in a diet in which fish figures prominently, because that is rich in methionine; similarly, leaf proteins would complement the low lysine and tryptophan contents of wheat proteins, though this mixture will still be methionine-deficient. These and other factors affecting the interpretation of feeding experiments have been discussed by others,[8, 9] and it is clear that two proteins which separately are inadequate may have a good feeding value if used together.

Whatever the ratio of the amino acids in a protein, these amino acids are clearly of no use if they are not liberated in an absorbable form in the gut of the eater. Amino acids can become unavailable because they have reacted with another component of the food, for example sugar, or because the protein is intrinsically indigestible, as keratins are, or has been made indigestible during preparation. This is an aspect of research on leaf protein that needs much fuller study than it has yet received, for it is reasonable to start with the assumption that if a batch of protein has a lower feeding value than its composition suggests it is the method of preparation that is at fault. The first step should therefore be to test the protein after it has been washed with water but not otherwise processed. Because of the difficulty of compounding feeding mixtures with products that have not been dried, this has not apparently yet been done thoroughly.

Protein products

On the assumption that our confidence that this protein can be produced cheaply is justified, and that its nutritive value turns out to be as good in practice as theory forecasts, it is worth considering how it would be used and by whom. The protein could take three main forms: bright green and perishable; a stable pale-coloured powder; soluble products made by partial hydrolysis. The first is the easiest to make but the most difficult to use because its colour is undisguisable. There is so much chlorophyll in any mixture containing a significant amount of leaf protein that has not been extracted with lipid solvents that it is nearly black, rather than green. To compensate for this it is worth emphasising that although the chlorophyll itself is probably of little or no nutritional importance the associated lipids contain a high proportion of unsaturated fatty acids. If even a fraction of the claims made for their nutritional significance are well founded, this source of fatty acids could be useful.

The problem is therefore to make palatable foods containing a bland, smooth, dark-green paste. We have made some experiments with mixtures of it with a proportion of finely pulped fresh leaves with strong flavours, *e.g.* parsley, mint, spinach, mustard, cress. The object was to impart a flavour that tended to justify the green colour, but there seems to be little advantage in this. It seems better to dispense with apology and try flavour combinations without regard to colour. Conventional cooking techniques have a 50,000-year start, and it is hardly likely that we will catch up as a result of a few dozen trials; but it is already clear that the protein blends excellently with small amounts of

The pressed residue, from which protein has been extracted, leaving the press.

the more fatty types of fish or cheese and that a mixture of egg and leaf protein, in which each contributes an equal amount of protein, scrambles well and has a pleasant flavour and texture. The best protein for trials such as these is made from young cereals such as barley, oats, wheat and rye; the yields are good, and these proteins have very little intrinsic taste. I have eaten many pounds of leaf protein and, while it has no appeal of flavour or texture, it is a perfectly acceptable and satisfying food.

Dry, solvent-extracted protein from most sources has a fawn colour, but it becomes darker when moistened. A few species, notably kale, give a white product. This can be added in quantity to a wide range of stews or baked mixtures; the darker material can be added to the extent of 10% or more if the mixture is itself dark in colour. As normally prepared it has a granular texture and it only softens slowly when put into water, but it is easily ground to an impalpable powder that makes a smooth paste with water. No experiments have so far been made with the products of acid or enzymic hydrolysis of the protein. They will be made, because partial hydrolysis is probably the only way to get leaf protein into neutral solution. As normally prepared it is irreversibly denatured by heating, and even if some other method were used to separate the protein from a leaf extract it undergoes spontaneous denaturation so rapidly that the end product would still be insoluble.

Under present circumstances there is probably only a limited outlet for leaf protein in Britain, though it would be useful as a supplement to the somewhat protein-deficient diets of strict vegetarians. In areas where cattle either are not or cannot be kept it is likely to prove extremely useful in raising the protein content of the food of children that are being weaned.

In most parts of the world, at present, the difficulty arises that the foods with a physical form adapted to infant feeding are predominantly starch and sometimes, as with cassava, nearly pure starch. Protein deficiency in young children is therefore very common, and even when it has been recognised as a clinical entity (for example as Kwashiorkor, which is at least in part a protein deficiency syndrome) it is difficult to do anything about it because adequate sources of protein of the types to which people are accustomed are not available locally.

Future course of research

The present-day need is not for more factory-made protein supplies in the industrialised countries but for more skill in making acceptable protein from local materials. It seems, therefore, that the future course of research on leaf protein should be: to determine the value as human food of material made here with the type of equipment we are using; to make an extraction unit that is better adapted for use by a village or small town in a less highly industrialised country than this; to study the vegetation in various localities to see which leaves could most advantageously be used as protein sources; to develop routine of cookery and popularise the final product. This last stage may not be so difficult as many sceptics think. Children start without preconceptions about food; also dried and pounded leaves are already used widely in many tropical areas, so that there is no basic hostility to the idea. There are, indeed, those who think that there is no need to separate leaf protein because leaves themselves could be used on a much greater scale than at present. This is undoubtedly true, but the amount of dried leaf that could be put into a diet is small on account of the fibre that is generally present. Unless a foodstuff is of such quality that it could safely be eaten in bulk, if the whim so took the housewife, it would be a retrograde step to advocate its use.

It is clear that the large-scale production and use of leaf protein presents an interesting range of academic and technical problems in agriculture, biochemistry trophology, and engineering. There is room and need for much more elaborate research than is now going on or proposed. The aspect of this work that is of most immediate concern to food manufacture is the preparation of a palatable and attractive product from the crude press cake that we make. **Co-operation on this will be very welcome, and we are anxious to supply protein to anyone interested in making use of it.**

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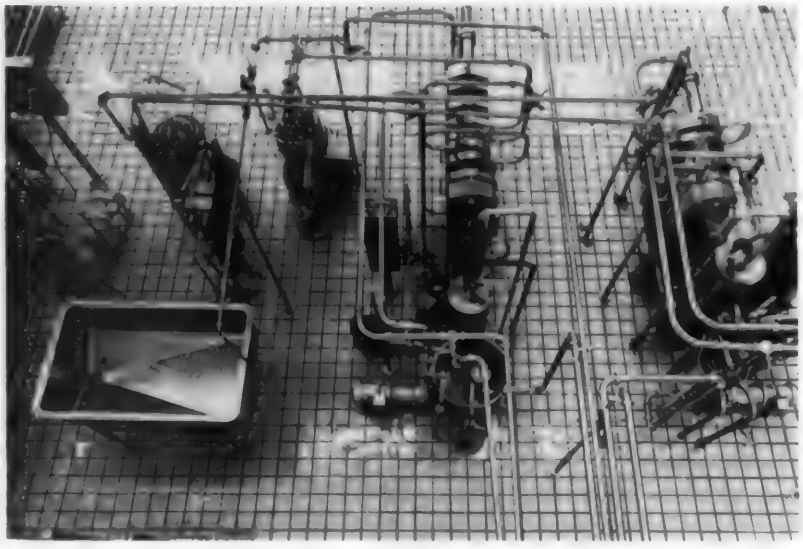
FLOORS FOR FOOD FACTORIES



A "FOOD MANUFACTURE" SURVEY

FLOOR FINISHES

By F. C. Harper, B.Sc., Ph.D.*

Food factories demand special and often conflicting requirements from floor finishes. Each process must be treated on its merits. This article discusses the various floor finishes available from the points of view of protection of structure, hygiene and safety. Questions of durability are also considered.

BECAUSE the conditions in food manufacturing factories vary so much from process to process it is impossible to consider the problems in detail and this article therefore considers only problems that are common to large sectors of the industry.

In a food factory, a floor finish is provided—

(*a*) to protect the structural floor and the building from traffic and effluents;

(*b*) to provide a hygienic, easily cleaned surface that will not harbour moulds, bacteria or vermin that may affect the raw materials or the product;

(*c*) to be safe against accidents to workers.

In addition, it may be a requirement that the floor shall be of good appearance and comfortable to tread, but these must be regarded as secondary requirements to be sought wherever possible.

The technical requirements outlined above have also to be considered in relation to cost, which introduces the question of durability, because first cost must not be the sole criterion; the possible costs of maintenance, repairs and renewal must also be taken into account bearing in mind that there may well be considerable disorganisation of the process while repairs are carried out.

Above: **"Acalor" flooring at the National Institute of Dairying, Holland** (*see also p.* 429).

It is proposed to consider floor finishes from the point of view of these technical requirements, separately indicating at the same time how the different requirements can conflict.

It will be assumed that the structural floor is of concrete made from normal or rapid-hardening Portland cement, and that this material must be protected. If the factory is working a dry process, or only dry areas such as warehouses are being considered, the intended floor finish has to withstand only foot and truck traffic. In most food factories the amount of trucking is considerable, and there is no doubt that the factory truck is

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TABLE I

	Water	Satisfactory pH range	Organic acids	Alkali	Sulphates	Animal and vegetable oil and fat	Sugar
Jointless Floor Finishes:							
Portland cement concrete	VG	7-12	P	G	P	P	P
High alumina cement concrete	see text	5-9	G	P	G	P	P
Bitumen emulsion cement	VG	7-12	F	G	not known	P	P
Pitch mastic (depending on grade)	VG	1-11	G	G-F	VG	F	F when hot
Mastic asphalt (depending on grade)	VG	1-11	G	G-F	VG	P	P when hot
Rubber-latex cement	G	7-12 but better than mixes without latex outside range	G-F	G	F-G	P	F-G
Resin emulsion cement	P	not particularly suitable in wet conditions				F	F
Bedding and Jointing Materials for Clay Tiles and Bricks:							
Portland cement mortar	as above for concrete						
Supersulphate cement mortar	VG	3-12	G	G	G	G	G
High alumina cement mortar	as above for concrete						
Silicate cement	P	0-7	G	VP	G	G	G
Sulphur cement	VG	0-10	G	G	G	P	G
Rubber latex cement	as above for jointless flooring but thin joint retards attack						
Phenol formaldehyde cement	VG	0-10	G	G	G	G	G
Cashew nut resin	VG	0-12	G	G	G	P	G
Furane resin	VG	0-12	G	VG	G	G	G

very destructive to floor finishes. Usually the wheels are of cast-iron, or at least of machined steel, and although rubber wheels would reduce wear considerably they are very much more difficult to move and are therefore unpopular with the men and slow down the movement of goods. The metal wheel must be accepted and the floor finish made sufficient to withstand it. There is, however, no need for trolleys without steering devices the wheels of which gouge out the floor.

Flooring materials

In most factories a high-grade concrete floor is usually adequate for such wear. It must be accepted that even the best concrete floor will produce some dust as it wears, and in food plants such dust is unwelcome from many points of view. It is preferable, therefore, to use floors not liable to produce dust, and various types are available such as industrial grade magnesium oxychloride, bitumen-cement, latex-cement, and resin emulsion cement. Both asphalt and pitch mastic are also dust free, but make the movement of steel-wheeled trucks difficult. Where power-driven trolleys are used and where there are heavy loads on stillages and pallets a concrete tile with metal aggregate or with a metal face is probably the best solution. In addition to having long life such a tiled floor can be repaired more easily than a jointless one; worn areas can be removed and replaced over a week-end without disorganising the process. These advantages must be set against a price at least three times that of *in situ* concrete.

If the process is wet, as many food processes are, many problems arise because the liquors may corrode concrete. These problems will be considered as they relate to a suspended floor because such floors are the more liable to become dangerous if attacked and also because it is objectionable for liquor penetrating such a floor to drip on to the floor below; much of what is said, however, applies with slightly less force to solid concrete floors. It is not intended to give more than an outline of the principles involved in the construction of corrosion resistant floors; the details of such work are best left to the specialists in this kind of work.

Portland cement and, therefore, concretes made from it, are attacked by many materials used in food processing. These are acids such as lactic, acetic (in concentrations such as in vinegar), tartaric, and oleic, stearic, and palmitic (in fact, all acids of *p*H less than 7); vegetable oils and fats such as tallow, lard, palm, olive, cottonseed, rape seed, and other oils; glycerin; sugar. They are also attacked by sulphate solutions and strong calcium chloride brines, but are resistant to alkalis, solvents and water.

The risk of corrosion to steel reinforcement must also be considered. If acids or salts can reach the steel it will corrode. A good cover of high-quality concrete is the normal method of protecting structural steel, but if the liquids are also corrosive to concrete other forms of protection are needed. It should be noted that solutions of common salt, which do not attack concrete, may reach steel reinforcement and produce corrosion. Liquid-tight protection is, therefore, indicated.

The rate of attack by the materials in food plants is not high, and there are a variety of constructions available which must be chosen by balancing their life against their cost. It is impossible to generalise about them because of the number of variables involved. Often experience of similar constructions in various conditions is the best guide to choice.

In providing a corrosion resistant floor there are two equally important factors to be considered; the design of the floor as a whole and the type of materials.

Design of the floor

It is seldom that the plant is designed to meet the flooring problems and the floor must meet all

sorts of conditions. Obviously the best way of preventing corrosion is to prevent spillage, yet it is common to discharge boilers of hot greasy water on to the floor and allow it to find its way to the drain. Such an approach is unnecessary, but even in the best run plant there will be some spillage and it is wise, if possible, to group spillage points so that the area of expensive special flooring may be kept small.

The greatest single precaution against corrosion is to provide adequate drainage by sloping the floor. In this way the low spots, which are present on all floors, are drained and do not become centres of corrosion. The steeper the slope the better the drainage but also the greater risk of accidents, so a balance must be made. In a food plant a slope of 1 in 80 may be considered the minimum with 1 in 60 as much as should ever be required.

The method of providing slopes is controlled by the siting of drains and other building features, but in general the liquors should not be shed towards the walls but to the centre of the floor. Also, in providing slopes it is important that obstructions and openings in the floor should not cause undrained pockets; all projections should be set so that they present the minimum resistance to flow. It is wise in designing a floor to provide an impermeable membrane over the concrete and below the floor finish. This allows a second line of defence in the worst conditions, and in mild conditions may allow a very much cheaper and less effective wearing finish to be used. This layer also effectively isolates the floor finish from movements of the structural floor which might otherwise cause damage. It is essential that the membrane be continuous, and it should slope to and discharge into a drain.

The commonest membrane is acid-resistant asphalt about $\frac{3}{4}$ in. thick laid on felt in two layers with all joints broken. Bituminous felt has also been used when laid with 3 in. lap joints carefully sealed with hot bitumen. Probably the cheapest but also the least certain method is to use three or four layers of tarred paper with overlapping edges and with the sheets in alternate layers at right angles. Recently polyethylene and polyvinylchloride films have been used experimentally for this purpose.

Materials for finishes

Seldom in a food factory is a completely corrosion resistant finish clearly indicated, and the choice of finish in such conditions is difficult. In conditions of mild attack a concrete finish may be satisfactory, particularly over a membrane, for several years. Eventually the combined action of effluent and trucks will make repairs necessary and finally renewal will be required, with its attendant disorganisation of production. A designer therefore faces the problem of whether to use a concrete or other cheap finish and replace it from time to time or to use a finish that will eliminate maintenance costs but at a very much higher initial cost. The type of plant will control this choice. Where there is continuous production as in bakeries and dairies it seems better to go so far as to overdesign in order to avoid repairs; at the other end there will be processes which are not much interrupted by repairs.

The choice of material, therefore, is decided on a balance of many factors, and the most that can be done here by way of guidance is to list the various materials in roughly rising order of cost and to give a broad indication of their properties.

Table 1 shows the resistance of different jointless floor finishes and of bedding and jointing materials to various liquids and solutions. The materials are in rising order of cost. The evaluation is given by a five-point scale: VG = very good, G = good, F = fair, P = poor, VP = very poor.

The following notes supplement the information given in the table.

Concrete made with Portland cement. The valuation assumes good quality high-density concrete made from normal or rapid hardening Portland cement. Greater resistance to sulphates is obtainable from sulphate resistant cement.

The rate of attack depends on the quality and density and a good quality material will have a good life in most mildly corrosive factories.

Concrete made with high alumina cement. Again a good quality material is assumed. Although only slightly better than Portland cement the resistance of high alumina cement to acids is enough to make it preferable in mildly acid conditions such as in dairies. At temperatures above 85°F. in wet conditions, high alumina cement loses strength and becomes porous; this will probably increase the rate of attack by materials which attack the unaltered cement. The low resistance to alkali is a disadvantage.

Mastic asphalt. The merit of asphalt floors is in their complete impermeability to liquids and in special grades to acids, but their poor behaviour to fats and heat and the difficulty of moving trucks does not commend them in many food plants.

Pitch mastic. Pitch mastic is more resistant to oils and fats than mastic asphalt, but otherwise similar.

Bitumen cement. Is used most frequently as a patching compound.

Rubber latex-cement. Latex-cement floors are slightly more slowly attacked than an ordinary cement mortar because of the protective action of the rubber. They are not resistant to oils.

Synthetic resin emulsion cement. Resin emulsion cements are more resistant to oil than latex cements but less resistant to water.

Jointed floor finishes. Clay tiles or bricks of engineering quality either red, blue or yellow are best for jointed finishes. The minimum thickness of tile should be 1 in.

The properties of the various cements are shown in Table 1. Joints made from Portland, high alumina, supersulphate and silicate cements are not watertight; the other cements are watertight.

It is doubtful whether the corrosive conditions in food factories are sufficient to warrant the very

Red acid-resistant asphalt flooring supplied by the Limmer and Trinidad Lake Asphalt Co. Ltd. and (*inset*) the method of laying the floor (*see also p.* 428).

expensive resin cements unless complete freedom from any repairs is desirable. Even so it would be sufficient in most circumstances to bed in a cheaper cement and only point in the dearer one.

A corrosion resistant floor in brick or tile is an elaborate construction. It is a major undertaking to cut holes in it and make the edges good. It should therefore be used only where the process is likely to continue for some time; if the plant is altered frequently it is better to use a simple floor system and renew it as necessary.

Hygiene and ease of cleaning

To prevent vermin and bacteria from collecting the obvious requirement is an impervious floor with no joints, that can be hosed down frequently. At first sight the jointless floors would appear to offer the best floor to meet this, but there are certain points worth considering.

The concrete floors either from Portland or high alumina cement inevitably shrink during their initial drying and a large area would crack. To avoid these cracks the shrinkage is reduced to the minimum by control of the mix and the mix is laid in small areas or bays. This, of course, means that there are joints between the bays and the floor is not really jointless.

The tiled floor despite its many joints is probably better than any in most circumstances. The tiles are impervious to liquids, and if the joints are narrow and from a cement which adheres to the tile there is no open crack between the tiles.

Safety from slipping accidents

The contribution of the floor finish to the problem of accidents is considerable, as is shown by the statistics of H.M. Inspector of Factories. Many of the accidents are caused by slipping or tripping and many by materials falling from trucks as they cross an uneven floor. An even, non-slip surface is clearly essential. The provision of an even, durable finish has already been considered; what must now be considered is the selection of a non-slip surface when durability and hygiene are over-riding considerations since the most durable and hygienic floors are not necessarily non-slip. It is easy to prevent slipping accidents by installing a cork floor, but its life would be short in most factories.

Generally the method of avoiding slippery floors is to roughen the surface. For example, concrete or clay tiles can be made practically non-slip by introducing carborundum during manufacture. The requirements of hygiene, however, demand a smooth impervious surface which is entirely at variance with safety because in wet circumstances, particularly where the men wear rubber boots, such a floor is particularly dangerous. The designer must therefore apparently choose between easy cleaning and safety. This is usually resolved by installing a roughened or ribbed floor at particular points of danger such as at sugar pans or at beef saws and making certain that the cleaning methods are particularly effective at these points.

A conflict of safety and durability arises when the floor must be sloped. A person is more likely to slip when walking on a slope than on the level, and the risk increases with steepness of slope. As already noted steepness of slope is necessary with corrosive liquids. The only compromise is so to design the layout of the plant that traffic moves across, rather than up and down, the slope, and this has the advantage that trucks are moved more easily and there is less risks of runaway trucks.

To summarise, there is no floor which will provide durability to all conditions, be hygienic and easy to clean and at the same time be non-slip. The conditions in factories and in various parts of the same factory vary considerably. The floor finish must therefore be chosen as the best compromise for the conditions, bearing in mind that initial cost must be balanced against the probable amount of repairs with their associated loss of production. Each process must therefore be treated on its merits.

TIMBER FLOORS

By R. P. Woods, B.A.For.(Cantab), F.I.W.Sc.*

IN the past timbers for flooring which were considered suitable were few in number, chiefly oak, pitch pine, deal and possibly jarrah and one or two others. Supply was plentiful, and damaged pieces of flooring were quickly replaced. With the advent of new methods of food processing, new conditions arose which necessitated more careful attention to hygiene, and to the behaviour of materials under the new conditions.

All timbers fall into one of two categories — hardwood or softwood. The distinction is a botanical one, and both hardwoods and softwoods can be and are used for flooring. Their respective merits must, however, be considered first. Softwoods, being produced by coniferous trees, can have resin in them, which could taint food. This difficulty can be overcome, and will be dealt with in the section dealing with finishes.

Individual timbers will behave differently when subjected to varying conditions, and if a floor has to carry certain known loads then the strength properties also must be taken into consideration.

Strength

The strength properties of most commercial timbers have been determined. Tests are based on standard procedures throughout the world and there is no need to dwell upon this aspect since the results are published in standard books and works of reference. There are limitations to laboratory tests, since results are based upon tests of small clear specimens, conditioned to standard moisture contents. Permissible working stresses have been determined to take into consideration factors which influence the strength of timber such as knots, irregularities of growth, splits and checks in seasoning, and also the moisture content of the wood.

This latter feature is of considerable importance both to the strength and stability of timber, and it is as well to examine it carefully. All timber contains moisture in one form or another, and the fact that wood is a hygroscopic substance, *i.e.* it will absorb moisture from or lose moisture to the atmosphere, is all too frequently overlooked.

The importance of moisture content and its effect upon the behaviour of timber—well understood by experienced flooring contractors—cannot indeed be overestimated, and trouble with timber in service can often be related to an incorrect moisture content having been specified. The ways of removing surplus moisture are twofold, (1) by air drying and (2) by kiln drying. The old rule for air drying was one year of drying for one inch of thickness, but it was not realised that in this country the moisture content of air-dried wood rarely falls below 16%. The moisture content of timber for use in a centrally heated building should not exceed 12%, and for choice nearer 10%, so that other means, such as kiln drying must be sought to bring the timber to the necessary low moisture content.

Properties of wood flooring

For practically all types of buildings, wood fulfils to an exceptional degree every important function called for in a flooring material. The essential properties can be concisely summarised under the following headings:

Resilience. Wood is resilient and is therefore more comfortable and less tiring to the feet than unyielding substances. This in turn might be expected to have its effect upon work people.

Thermal insulation. Wood has high qualities of insulation and, being a low conductor of heat, is comfortable at all times and never strikes cold. The installation of floors in wood undoubtedly reduce heating costs in winter as fuel is not wasted in first warming the floor every morning.

Appearance. Certain flooring timbers, notably hardwoods, having inherent beauty of grain, texture and colour, produce a decorative effect that is unsurpassed among flooring materials. As wood is a natural product, there are always slight variations in grain which prevent monotony and give character and added interest to the floor.

Ageing. Timber does not "tire" as do many other materials, nor does it vary in hardness at different temperatures; exposure to sun causes no deterioration. On the contrary, if properly cared for, floors of wood will mature and improve with age long after other materials have become unserviceable.

Ease of maintenance. A property of timber which is of importance is that wood floors can be renovated with comparative ease after years of wear or neglect, so as to reconstitute their original appearance; this is perhaps a unique feature applying only to wooden floors. Their maintenance, with the development of floor seals and proprietary cleaning compounds, is comparatively simple, but water should be used sparingly since blocks and boards will tend to swell when subject to wet conditions.

It should be emphasised at this juncture that technical knowledge and skill and experience must be applied both to the manufacture and laying of wood floors if the best results are to be obtained.

Resistance to wear. Different species of timber are available for every degree of wear. Many hardwoods will withstand the heaviest usage, but where traffic is light a

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wide range of timbers, including softwoods, will give excellent service.

Tests have been carried out to determine the resistance to wear of different timbers. This work is executed by the Forest Products Research Laboratory, who have placed timbers in four wear categories—(1) very high, (2) high, (3) moderate and (4) low. In alphabetical order the following timbers are listed in the first two categories:

1. Greenheart, rock maple, mugonha, muhimbi, muhuhu, East African olive, pyinkado, Rhodesian "teak" and Wallaba.
2. Banga-wanga, beech, Canadian birch, ekki, spotted gum, gurjun/yang/keruing, jarrah, karri, loliondo, makarati, makore, mussine, oak, panga-panga, white peroba, Rhodesian "mahogany," tallow wood and teak.

This does not complete the list, but it is felt that the inclusion of timbers coming under the moderate and low categories whilst being suitable for light pedestrian traffic would not prove entirely satisfactory in factories where trucking of one kind or another is carried out.

A dense heavy timber usually coincides with a fine texture, and in this respect Canadian rock maple is a magnificent timber for such purposes as flour mills or factories where such material is processed. It stands trucking excellently, presents a smooth surface on which fine ground materials will not cake or get embedded in the timber, and can almost be described as the timber par excellence for this type of work. The Japanese maple can be compared in its resistance to abrasion with Canadian maple, and as possible alternatives muhimbi, muhuhu and mugonha from East Africa are also suitable. These woods are fairly highly coloured and not the clear whitish-yellow to occasional golden-brown of the maple, but this may prove an advantage in certain circumstances.

Wet process manufacturing, such as freezing, bottling, etc., will require a timber of a high natural durability. Rhodesian "teak" has been used very satisfactorily as have jarrah and muhuhu. Others with the same resistance to decay would be greenheart, tallow wood, teak, ekki, pyinkado and East African olive. Pressure treated softwood floors can be laid in certain departments where durability is of primary importance, and end grain blocks, similar to road blocks, could be used in reception areas. However, each site will require special consideration, and there are timbers which can be specified with every confidence in every situation providing attention is paid to the requirements and full information on the conditions of use are given to and discussed with an experienced flooring contractor.

An attractive floor both in colour and appearance can have a psychological effect upon workpeople, and in this respect a wide range of colours is available in timber. It is a natural product, and many trees may have been cut to provide the flooring, thus uniformity of colour in timber is not to be expected, but it has more character so, and the variations in colour will give pleasing results.

Information on flooring timbers can be obtained from the Timber Development Association or from members of the Hardwood Flooring Manufacturers Association.

FLOOR CLEANING AGENTS

THE most common agent employed in the cleaning of the floors in a food factory is water. All kinds of water are not equally suitable for cleaning purposes, and it may be necessary to treat the water or to employ a cleaning agent suitable to the particular type of water available. The chief source of trouble is hardness in the water, caused by the presence of calcium and magnesium salts. If soap-based detergents are used with hard water, insoluble soaps are formed, and these increase the quantity of detergent which must be used and give rise to deposits of scum that may subsequently be removed only with difficulty. Such deposits not only detract from the appearance of the floor, but may entrain bacteria and provide fertile breeding grounds for them. In such cases it is not always necessary to soften the whole water supply, but steps should be taken to soften the water used for cleaning purposes. Soda ash is commonly used for this purpose, and detergents containing soda ash prevent excessive consumption of soap. They do little, however, to prevent the deposition of scum. Several phosphate salts have proved more effective in this respect, including sodium hexametaphosphate (*Calgon*) and sodium tetraphosphate (*Quadrafos*). These phosphates have the disadvantage of being hygroscopic, however, and in recent years they have tended to be replaced by sodium tripyrophosphate, which does not have this disadvantage.

These phosphates not only prevent the formation of soapy scums, but are effective in removing scums previously deposited by the use of unsuitable detergents.

Alternatively, when the water is hard, it is possible to use synthetic detergents which are not affected by the presence of calcium and magnesium salts. The calcium and magnesium salts of many of the newer cationic detergents are quite soluble, whilst some of the most recent surface-active materials are non-ionic in nature, so that metallic salts are not formed.

Alkaline cleaning agents

The greatest part of all cleaning work is done by some form of alkaline compound. This class of compounds includes ordinary soaps (which will be discussed separately) and compounds of the type described below. Sodium hydroxide (caustic soda, lye) is

one of the most extensively used alkaline detergents, and there are times when it is unsurpassed for the removal of grease and various food residues. It is too corrosive for many purposes, however (as, for instance, when used on high-alumina cement floors), and it has been supplanted in most compounded detergents of this type by milder alkalis.

Of these, sodium carbonate (soda ash) is still widely used. This has many of the cleaning properties associated with compounds which form solutions with a high ρH, as well as the water softening powers already discussed. In addition, it is much less corrosive and much safer to handle than caustic soda.

Another alkaline material much used in the compounding of detergents is trisodium phosphate. This is claimed to be superior to sodium carbonate in many ways, both as a detergent and a water softener. The use of polyphosphates for the latter purpose has already been discussed. Unlike sodium phosphate and soda ash, the higher phosphates are rarely used alone but they are extensively used along with surface-active agents in detergents of a mixed type.

Several of the sodium silicates also have important detergent properties, and are used along with soaps and other cleaning agents. Many of them are extremely strong alkalis, but their detergent powers are not dependant on this alone. They have colloidal and dispersive properties, and the valuable power of protecting surfaces to be cleaned from the damaging effects of strongly alkaline solutions.

Surface-active agents

One of the chief difficulties arising in the aqueous cleaning of any substance is the securing of adequate contact between the water and the particles of dirt. The latter are generally partially oily in nature, and the water is repelled without being able to wet them and dislodge them from the material to be cleaned. It is therefore customary to include in detergent compounds a surface-active agent which, by lowering the surface tension of the water—or the tension at the water/oil interface—promotes the wetting of the particles of dirt and thereby facilitates their removal. The oldest of these compounds is ordinary soap, and this is still widely used. In recent years, however, increasing use has been made of synthetic compounds with this property, which do not possess the disadvantages peculiar to soap.

Soaps

Soaps in general have the disadvantage of giving rise to insoluble calcium and magnesium salts when used with hard water, and the steps which can be taken to avoid this have already been discussed. They have the added disadvantage of being effective only in alkaline conditions. In normal circumstances, this alkalinity is provided by the soaps themselves, but it is common practice to reinforce this natural alkalinity by incorporating some other alkaline material in them. Even so, soaps may give extremely unsatisfactory results in food factories in which acid materials are likely to be spilled on the floors.

Synthetic detergents

The synthetic detergents which have flooded the market so liberally in recent years can be divided into three main classes—anionic, cationic, and non-ionic. The anionic detergents, which from a sales point of view form the largest group, are so called because their large active ion carries a negative charge. They are now widely used, both alone and in combination with alkaline detergents such as phosphates, carbonates, and silicates, and there is no doubt that they give excellent results. They are not nearly so prone to the deleterious effects of hard water as soap, and they are effective over a much wider ρH range. They are therefore more suitable for use in establishments where acids are used.

In recent years, non-ionic detergents have come increasingly to the fore. These compounds also are completely unaffected by the hardness of the water and by the presence of dilute acids. Many of them are powerful surface-active agents, so that they have wide applications for cleaning in the food industry. Some of them are reported to be excellent detergents in the presence of sea-water, a fact which may be of interest to processors of marine products.

The cationic detergents carry a positive charge on their active ion, and consist largely of compounds of the quaternary ammonium type. They are not widely used for simple cleaning purposes, although they possess marked detergent properties. Their main use has been as anti-bacterial agents, and they will therefore be considered further under this heading.

Disinfectants and bactericides

It is good practice, when obvious dirt has been removed from the floors, to treat them with some form of bactericidal agent. By far the most common substance used for this purpose is calcium hypochlorite. Sodium hypochlorite, which has essentially the same action, is also widely used. These sources of active chlorine have the advantage of being powerful bactericides which are cheap, rapid in action, and relatively non-toxic. They are somewhat corrosive, however, and their powerful odour sometimes renders their presence objectionable whilst the actual preparation of food is going on. There has therefore been a tendency to replace them in some operations by compounds of more recent origin. One such group of compounds comprises the quaternary ammonium salts. Many of these compounds have a rapid and powerful bactericidal action, and tend to be adsorbed on surfaces to which they are applied, thus providing some degree of residual activity. This makes them particularly suitable for use on floors. In addition, they are non-corrosive, non-toxic and non-irritant, in the concentrations recommended for use, as well as being colourless, tasteless, and odourless. They cannot be used, however, in combination with anionic detergents.

MACHINE CLEANING OF FLOORS

WHATEVER method is used to clean the floor in every food manufacturing, storage and purveying establishment, the goal of the management is fourfold:

1. A high standard of cleanliness and hygiene.
2. To create floor conditions so that materials and staff are safe.
3. To achieve a high standard of appearance.
4. To do all these things at low cost.

Dealing with these essential objectives individually:

1. *A High Standard of Cleanliness and Hygiene.* As in no other industry, this single factor plays an all important part in the manufacture of all types of food. Quite apart from legislation and official inspection, the reputation of the manufacturer concerned depends upon an indisputable standard of cleanliness at all stages of production and storage. Many manufacturers, conscious of their public duty and self-interest in this matter, have investigated thoroughly, and in consequence installed, power floor cleaning machines so as to be certain that the highest standards are always achieved.

2. *To Create Floor Conditions so that Materials and Staff are Safe.* In the most modern factory, under the most vigilant management, it is inevitable that production floors become soiled.

With the use of power floor cleaning machines floors can be scraped for the speedy removal of compacted deposits, scrubbed and high-pressure scoured quickly and efficiently with accurate control of the flow and amount of water. Then by using power drying machines the floor can be dried so quickly and effectively that there is neither hazard to staff nor raw materials.

3. *To Achieve a High Standard of Appearance.* There is no doubt that workers are materially affected by the surroundings in which they work. Bright conditions and light and clean workrooms help to instil a happy, contented frame of mind in all grades of workers so that production is increased. This is particularly important where female labour is employed on repetitive work.

Courtesy of Columbus-Dixon Ltd.

Power machines for floor scrubbing and floor drying.

Also several food manufacturers have discovered the publicity value of organised visits to their works. It goes without saying, however, that this pre-supposes that every part of the works and offices, etc., must be maintained to high standards of cleanliness and appearance. Power floor cleaning machines quickly achieve a good appearance.

4. *Clean at Low Cost.* Whilst every reasonable owner or manager wishes to have high standards, all too frequently the cost of achieving them proves to be a stumbling block. Labour costs are increasing every year, and in many areas labour is just not available for the job of cleaning. The introduction of power floor cleaning machines has helped to solve these problems. Machines are so much quicker and more efficient that they save as much as 80% of the cleaning labour costs so the capital cost of the value of the machine can be recovered out of savings in a very short time.

Selection of Machines. The concentrated weight floor cleaning machine is worth consideration for heavy duty. The whole weight of the machine is concentrated on a large single brush so that the long bristles are forced into every crevice. This is combined usually with a hot, strong odourless detergent. Where detergents cannot be used, the weight of the machine helps it to do a good job. It can be used for waxing floors, and by a single brush change it can be converted into a scraping machine.

The divided or split weight machine is admirably suited for many cleaning and polishing jobs, but it does not have the same cleaning weight as the above machine because the whole weight of the machine is divided between the brushes and transporter wheels.

The third type of machine available is the horizontal or strip brush machine. This also is an efficient and reliable machine for cleaning and polishing floors, but it is not so heavy as the concentrated weight machine, nor does it present to the floor such a comparatively large area of brush.

MATERIALS FOR FLOORS

Structural floors

SEVERAL types of composite prestressed and reinforced concrete floors are supplied by the Trussed Concrete Steel Co., Ltd. These include *Truscon* precast floors, which are made in two types. The Standard, Type 1, is composed of inverted trough-shaped units, to the under side of which a ceiling of board or plastered metal lathing may be added. The Suspended Tread, Type 2, is made of upright trough-shaped units, usually carrying board flooring on insulated "saddles." The units are made to suit individual requirements of load and span, normally up to a maximum length of 18 ft. 6 in.

The same firm also manufacture *Hy-Rib*, a metal mesh available in various gauges and sheet-sizes and designed to serve either as a combined shuttering and reinforcement for floors or roofs, or as a long-span base for plaster ceilings or partitions.

A floor of "Stelcon" Anchor steel plates laid in a bakery.

Monolithic floors

Various types of concrete and asphalt are used for this purpose. Special aggregates designed to eliminate dusting and the development of unhygienic cracks have been developed by Prodorite, Ltd., an example being *Prodordur Type "A,"* which is used in conjunction with Portland cement. Another product useful in the construction of granolithic floors is *Prodoraqua* waterproofer and hardener, which is said, in addition, to provide a dust-free surface. An acid-resistant mastic asphalt, intended to provide an impervious membrane beneath tiles and other surfaces on which there is frequent spillage, is marketed by this firm under the name of *Prodorphalte*.

The Adamite Co., Ltd., also manufacture a substance designed to increase the resistance of concrete floors to corrosion. Their product *Colemanoid*, when incorporated into cement mixes, is said to give a very dense surface, impervious to water, oils and fats, and to increase the strength of the concrete by more than 25%. The resistance of the concrete to acids and alkalis, and to heavy abrasion, is also said to be increased.

Several types of flooring are laid *in situ* by MacNab and Co. (Floorings), Ltd. All the mixes compounded by this firm have a magnesium cement base with a cold bitumen emulsion additive. Fillers and aggregates are graded and varied, together with the strength of cementation, to provide for a variety of uses. These floors are said to be very hardwearing and dustless, and less noisy and fatiguing than normal concrete floors. They are highly resistant to fats and grease, which are said indeed to have a preservative action on the floors, but they do not resist alkalis or alkaline detergents, and although they may be washed down, they are not suitable for use where water is left lying for long periods. The floors are quite odourless, and are therefore suitable for raw-material stores, warehouses, etc.

Jointless asphalt floors are provided by the Limmer and Trinidad Lake Asphalt Co., Ltd. Four grades of *Lithocrete* are designed to stand increasing traffic loads, and for areas in which spillage of food materials occurs, two grades of *Acetas*, an acid resistant flooring, can be provided. For situations in which spillage of oils and fats occurs, this company recommends the use of either Trinidad pitch mastic flooring or *Oilphalt* oil-resisting mastic.

The Terradura Flooring Co., Ltd., also produce a range of flooring materials with applications in the food industry.

Unit floors

Although the properties of jointless floors have now been much improved, floors constructed of unit materials retain certain inherent advantages, and many manufacturers still prefer to install them. Tiles suitable for this purpose are also made by the Adamite Co., Ltd. Their *Prestile* is a hydraulically pressed concrete tile containing quartz aggregate and a hard alumina abrasive grain. It is claimed to have exceptional "non-slip" properties, and to be highly resistant to acids, alkalis and fats.

Another extremely hard and durable tile widely used in the construction of industrial floors is the *Duromit* tile, manufactured by Duromit, Ltd., for whom Mac-

A typical unceilinged "Truscon" precast floor in the factory of H. W. Carter and Co. Ltd., Coleford.

Nab Paving, Ltd., are agents and laying contractors.

The Terradura Flooring Co., Ltd., specialises in floors of non-magnesite blocks, which are said to withstand heavy traffic and to be highly resistant to water and acids, though they are attacked by alkaline materials. The units are marketed under the names of *Nortonia* blocks and *Durablocks*.

Extremely hardwearing properties are also attributed to the *Stelcon* steel-clad and mineral-clad flags manufactured by Stelcon (Industrial Floors), Ltd. These are highly compressed and very dense, so that their surfaces, although not resistant to acids, are virtually non-absorbent, and can easily be freed from any corrosive materials or other contaminants.

A very different type of unit floor is made by the same firm. By the use of their Anchor steel plates an almost all-steel floor can be obtained. These plates are designed to be set in concrete to provide a dustless floor which will stand up to heavy traffic and to all corrosive materials at the concentration at which they normally occur in food factories. This type of floor has been widely used in bakeries and in the dairy industry.

Semtex (Industrial Division), Ltd., provide floors composed of acid-resistant tiles or paviors bedded and jointed with resistant mortars. The choice of cements varies with the nature of the work carried out, but furane-resin-based cements have been widely used in food factories. Semtex floors have been laid in the meat-processing, sausage-making, soft-drinks, mineral-water, brewing and confectionery industries.

Acalor (1948), Ltd., have also made a speciality of floors for food factories. They make a wide use of cashew-nut-oil resins, and to a lesser extent of epoxy and furfuryl resins, in the cements for these floors.

Floor finishes

Among the lighter-weight flooring materials, used essentially as finishes laid on floors of concrete or other basic material, polyvinyl chloride is finding increasing use. P.V.C. flexible plastic sheeting is supplied by the Adamite Co., Ltd., and costs from 32s. per sq. yd. laid. It is supplied in rolls 72 in. wide and in lengths of up to 25 yds. For areas where there is heavy spillage of liquids the joints in the material can be permanently sealed. This type of flooring is said to have been successfully installed in sugar-beet plants, bakeries and other food factories.

"Altro" heavy-duty P.V.C. flooring laid in sheet form by the Adamite Co. Ltd., in the Andrews Liver Salts section of Scott and Turner's factory at Newcastle.

Widespread use is also made of P.V.C. in the form of tiles. These can be obtained in many attractive colours, the colour running evenly through the tile, so that wear and tear does not make the floor increasingly unsightly. Among the makers of these tiles are Nairn and Co., Ltd., and the Terradura Flooring Co., Ltd., who market *Fibroline* tiles and pieces up to 36 in. in length.

Semtex, Ltd., also make tiles of this type, which are sold under the name of *Vinylex* tiles, and British Mouldex, Ltd., make a range of similar materials. These include *Durever* vinyl plastic flooring, which is marketed in two sizes of tiles and in rolls 36 in. wide. Another thermoplastic flooring tile made by the same firm, the *Riltile*, is made in a special industrial grade which is said to have high acid- and oil-resisting qualities. Rubber flooring tiles are also featured in this firm's range of products.

The resistance of concrete to corrosion can be increased, and working areas made smarter and more cheerful, by the application of rubber floor paints. A paint of this kind, *Tretol*, is made by Tretol Associated Products, Ltd., and is said to be resistant to attacks by mild acids and alkalis and by oils and greases. It can be applied directly to concrete floors.

"Semtex" acid-resistant tile flooring, bedded and bonded in a resistant cement, in a mineral water factory.

NISIN in Food Technology—2

By H. B. Hawley*

In Part I of this survey (FOOD MANUFACTURE, August) of the uses of nisin as a food preservative, an account was given of the role of this antibiotic in the manufacture of natural and processed cheese. The possible applications of nisin in canned goods were also discussed. In this concluding part Mr. Hawley describes the possible uses of nisin in the preservation of other foods and in combatting the dangers of food poisoning.

Semi-preserved meats, open-pack meats and sausages

THIS category of foodstuffs includes the canned commodities such as hams which cannot be sterilised because of heat-damage and consequently are only "pasteurised"; the cooked meats such as brawn, boiled ham and Bath chaps; and finally the divers sausages, which may contain fresh meat, alone or with various fillers, brined and pickled meat, and sometimes preservatives such as sulphur dioxide. These sausages may be fresh, cured, smoked or mould-ripened. Only very rarely are any of these products freed from all vegetative bacteria during manufacture. Generally they have a vegetative flora characteristic of the particular product, and this may have superimposed on it an adventitious flora depending on the conditions of handling.

In view of the variety of such foodstuffs and the multiplicity of micro-organisms forming their psychrophilic and mesophilic flora, it is impossible to generalise concerning the value of nisin in enhancing the life of the commodity or in preventing specific defects. Many of these bacteria will be insensitive to nisin; a few, such as certain of the lactic streptococci,[18] or yeasts,[16] may destroy nisin, and yet others may block the effect of nisin on sensitive bacteria. Furthermore, the effect of nisin on a sensitive or relatively insensitive organism in a complex substrate may be different from that obtained *in vitro*. Concentrated preparations of nisin have only become available so recently that information is almost completely lacking, consequently its effect cannot be predicted in the absence of extensive trials.

It is quite obvious, however, that nisin has no application as a general preservative, and this is, no doubt, a good thing. It would seem that its greatest application may be in the control of certain specific defects such as, for example, the greening caused by lactobacilli and the souring due to lactic acid bacteria ("bone-taint") in hams. If it proves effective in such cases, it is almost certain that the effectiveness will be greatly influenced by the general bacteriological cleanliness of the product and that it will fail in the case of mishandled packs with high counts of adventitious contaminants.

Salmonellæ are insensitive to nisin, consequently careful consideration must be given to the possibility that any salmonella infecting a semi-preserved product may multiply in the absence of competition. For this reason it is necessary to give careful consideration to this aspect when considering a specific application and to preclude the use of nisin in the case of products where there is a risk of salmonella infection. This risk exists only in the case of semi-preserved packs, and there is insufficient experimental data to enable the hazard to be properly appraised. In the case of chlortetracycline and oxytetracycline there is serious risk because these antibiotics have a broad anti-bacterial spectrum and may therefore permit the multiplication of salmonellæ as a result of eliminating practically all the potential competitors. Furthermore, by retarding putrefaction they may give the false impression that the foodstuff is innocuous. It is not thought, however, that this risk is very great in the case of nisin, in view of its relatively narrow antibacterial spectrum and on account of its destruction by many yeasts,[16] by certain streptococci[18] and by some of the lactobacilli.[30, 85]

No studies on the use of nisin in the preservation of hams and ham-canning have yet been made, but this application deserves very thorough investigation because of the perishable nature of this commodity and the heavy losses which may be involved. The spoilage and souring of hams has been shown to be due to a variety of clostridia, some of which produce toxins.[73, 86-9] The organisms isolated include *Cl. putrificum, Cl. sporogenes, Cl. tertium, Cl. histolyticum* and possibly *Cl. œdematiens*.[90, 91] An even greater range of clostridia[47] in French canned hams and other semi-preserved meats such as hamburgers and tongues has been reported. The practicability of introducing nisin into hams needs thorough investigation. The stability of nisin in curing brines also remains to be investigated, but this mode of introduction would probably prove too expensive. A more attractive approach might be to infiltrate hams with a nisin solution, since it seems likely that effective dispersion would be achieved in view of its intensely surface-active properties.

Lactobacilli are frequently present in canned hams, since some are relatively heat resistant and may survive pasteurisation.[92, 93] They are not pathogenic, but they can cause souring and under certain conditions they cause green discolorations. *Lactobacillus brevis* is the strain commonly associated with greening, and this

* Director and Director of Research, Aplin & Barrett, Ltd.

organism is sensitive to low concentrations of nisin.

An ever-present danger with canned hams is the possibility of staphylococcal food poisoning due to the presence of the enterotoxin formed by *Staph. pyogenes* var. *aureus*.[94] There are many factors which determine the growth of *Staph. aureus* in hams,[95] but it would appear that it may multiply during the period of heating prior to the cans reaching the pasteurisation temperature, so that if the initial count is high its destruction may be incomplete.[96] *Staph. aureus* is very sensitive to nisin,[13] and whilst it would be undesirable to place reliance on nisin as a means of preventing staphylococcal poisoning, its presence in hams to suppress clostridia would provide a valuable additional safeguard.

Many types of sausage and a large variety of open-pack cooked meats are susceptible to souring by lactic acid bacteria (lactic streptococci and lactobacilli), to greening caused by lactobacilli,[97] and to the possibility of enterotoxin production by coagulase-positive staphylococci. Here, too, is an interesting field of investigation into the advantages of using nisin after giving careful consideration to each particular application and to the advisability of protection in relation to the risk from salmonellæ.

Gelatine is often an ingredient of semi-preserved meats and of some canned meats. Its bacteriological condition is therefore of considerable importance since it may introduce a considerable variety of clostridial spores into any product containing it. Buttiaux[89] has made a careful study of gelatines in use in France; he isolated the spores of *Clostridium, Plectridium* and *Inflabilis* from 52 of 90 samples examined. The strain isolated most frequently was *Cl. perfringens*, but several other strains were also obtained. The processes involved in the manufacture of gelatine are such that it is difficult to exclude all spores from the finished product, and the manufacturer might do well to consider the desirability of including nisin in the grades used in food manufacture. This might prove invaluable in several respects since colonies of clostridia may be found growing at the gelatine-meat interfaces in various canned meats which have only been pasteurised. Furthermore, outbreaks of clostridial and staphylococcal food poisoning are often associated with products containing gelatine.

Pickles

Pickles and certain brined products may suffer from various bacterial defects caused by clostridia, bacilli and lactobacilli. Brined cucumbers are liable to deterioration caused by clostridia and certain lactobacilli; pickles to similar defects, including blackening from the growth of *B. nigrificans*. Brined olives of all types are susceptible to a form of malodorous spoilage known as Zapatera, which is of somewhat obscure ætiology but believed to be due to clostridia.[98]

In the absence of any work on the subject it would be rash to express an opinion as to the efficacy of nisin in any of these troubles, but there are obvious possible applications.

Beverages: Sterilised milk and chocolate milk

Sterilised milk, if its designation is to be taken literally, should present no bacteriological problems. In commercial practice, however, the expression is used collectively to include milk which has been heated to near its boiling point for various periods of time to destroy all but the exceptionally heat-resistant spores. As a result, a great deal of the commercial sterilised milk is not in fact sterile but the spores which remain viable are usually so inactive that the milk has a perfectly satisfactory shelf-life. A wide range of spore-formers, including both mesophilic and thermophilic types, has been isolated from commercial sterilised milk.[99]

Various types of spoilage have been attributed to the thermophiles, for example: carbolic taints, due to *B. circulans*,[100] which will resist 110°C. for 40 minutes; feathering, when added to tea or coffee, caused *B. subtilis* and strains of *B. cereus*;[101] a bitter taint due to *B. thermoacidurans* (*B. coagulans*) and an oxidised flavour caused by *B. circulans*.[101] *B. calidolactis* was found by Clegg[81] to be the cause of a very serious outbreak of trouble in an English creamery, the sterilised milk clotting in the bottle before it left the factory. This organism is a thermophile, and it was found that unless the sterilised milk was cooled promptly after processing coagulation occurred within a few hours. Its spores proved most refractory and ordinary sanitary measures failed to eliminate them from the factory; they were resistant to 1,500 parts per million of hypochlorite during 60 min. contact and to a quaternary ammonium disinfectant at a concentration of 1 : 100 (which failed to kill the spores in 1 hr.); they resisted 20% sodium hydroxide solution for 15 min. and steaming of the factory plant at 100°C. for 9 hr. failed to eradicate them. When milk containing the spores of this thermophile was used to make rice puddings, it curdled before the rice was cooked. Work is in progress in the research division of Aplin & Barrett, Ltd., and at the National Institute for Research in Dairying, at Reading, to investigate the effectiveness of nisin to control such processing problems which are sporadic but widespread. Similar difficulties have been encountered in Belgium for several decades, and in 1947 reached disastrous proportions and caused grave economic loss.[81]

Chocolate milk is another product which merits an investigation into the possibility of controlling thermophilic spoilage by means of nisin. Bacteriological troubles are aggravated by the thermophiles which are introduced with the other ingredients.

It might at first sight appear to be a simple matter to test the ability of nisin to check such forms of spoilage. Unfortunately *in vitro* experiments can give misleading results because the antibiotic action in a complex substrate may differ markedly from

the results obtained with single strains in broth. Consequently, it is unwise to surmise without the data of extensive field trials.

Cream and butter

In various parts of the world it is the practice to separate milk on the farm, to use the separated milk for stock feeding and to reserve the cream for sale to butter factories. The distances of isolated farms and villages from the creameries may be such that it is only practicable to collect the cream two or three times weekly. In view of this, the keeping quality of market cream is a major problem, which is usually resolved by the use of a preservative such as hydrogen peroxide; but the addition of this substance to market cream is undesirable for various reasons. This practice is prevalent in Australia, and it has led the Commonwealth Scientific and Industrial Research Organisation (C.S.I.R.O.) to investigate the use of nisin as an alternative. The results of this investigation have not yet been made public, but it is believed that an adequate market life may be achieved by such means. A similar enhancement of the shelf-life of pasteurised market cream cannot be obtained, a result which is not surprising since the improvement in the case of raw cream is no doubt attributable to the inhibitory effect of nisin on many of the lactic acid bacteria.

It might be expected that nisin should similarly enhance the shelf-life of butter, but no work in this field has been reported. The microbial flora of butter is, however, very diverse, so that no safe *a priori* conclusions can be drawn. Preliminary investigations might first of all be most usefully directed to a study of its effect on the keeping quality of butter manufactured from ripened cream and blends of this product.

Food poisoning

Such serious consequences may result from the multiplication of food poisoning bacteria in foodstuffs and their subsequent dissemination that only the strictest control measures can be tolerated. Nevertheless, in spite of much legislation concerning the application of hygienic principles to the food industry and the very stringent control measures adopted by all civilised communities, serious outbreaks of food poisoning still occur. The complexity of life in any highly organised society renders it almost inevitable that there will always be an incidence of outbreaks resulting from human mistakes and errors of judgment. If such a view is accepted, it might then be realistic to explore the use of an antibiotic such as nisin as an additional safeguard or insurance against certain types of food poisoning. On the other hand, it would be reckless and quite unjustifiable to use it in lieu of any established control measure or safeguard.

Food poisoning caused by the coagulase - positive staphylococci and pathogenic clostridia has a high incidence throughout the world. In England and Wales during 1955 there were 138 reported incidents of staphylococcal food poisoning and 90 incidents of *Clostridium welchii* (*Cl. perfringens*) food poisoning.[102] It is therefore interesting to note that in general both these groups of micro-organisms are quite sensitive to nisin, and it would be interesting to consider the possible advantages of the use of nisin in foodstuffs likely to be infected with these pathogens.

(i) Staphylococcus

Staphylococcal food poisoning is due to an enterotoxin elaborated by coagulase-positive organisms (*Staphylococcus pyogenes* var. *aureus*) belonging to a particular bacteriophage and serological group. The toxin is fairly heat-resistant since it withstands boiling for 20-30 min. and therefore may persist in a foodstuff in which the staphylococci have been killed by prior heat - treatment. The count probably has to reach many millions of staphylococci before sufficient toxin is formed to cause illness.[94] The food poisoning strains are associated with human and animal carriers, infection of the foodstuffs thus resulting from unhygienic practices. For this reason the products commonly involved are open-pack cooked meats, fresh meat and fish, pies, re-heated meats, stocks, trifles, artificial cream and custards.[102] A moist substrate and warm humid conditions are ideal for growth and toxin production. Food may suffer droplet infection from nasal carriers or from a food handler with a septic finger, consequently many outbreaks have been attributed to canteens where meals may be kept warm for long periods. Since contamination with the odd staphylococcus is hard to eliminate and it is in the canteen and catering establishments where the conditions may be provided for its prolification, nisin would appear to provide just the additional protection needed against such contingencies.

As will be appreciated from this review there are many foodstuffs in which it would be advantageous to incorporate nisin in order to control various types of spoilage. Its presence incidental to such uses would undoubtedly contribute a measure of safety against staphylococcal food poisoning. The deliberate addition of nisin to stocks and like dishes or its deliberate inclusion into some of the ingredients used in their preparation, and in the preparation of such foodstuffs as artificial creams, custards, trifles, mousses, is a matter which would also merit careful consideration by public health authorities.

(ii) Clostridium

From the standpoint of food poisoning the pathogenic clostridia are *Cl. botulinum*, *Cl. welchii type A*,[103] *Cl. welchii type F*,[104] *Cl. bifermentans*[105] and *Cl. subterminale*.[106]

Cl. botulinum is far too dangerous an organism to be trifled with, and only the most stringent and well-tried procedures for controlling or destroying it can be contemplated. No reliance should be placed on any inhibitory substance of bacterial origin since all such substances are liable to loss or to destruction by other micro-organisms in the environment, as a result of processing or other for-

tuitous circumstances; also the possibility of resistant-strains must be considered. No consideration is therefore given to any conceivable application to this organism in this discussion.

Cl. bifermentans and *Cl. subterminale* have not, so far as recorded, been a cause of many outbreaks, and since their sensitivity to nisin is substantially the same as that of *Cl. welchii* (*Cl. perfringens*) only the latter will be considered here.

Poisoning usually manifests itself as an acute gastro-enteritis which is caused by a heat-resistant toxin. Outbreaks of poisoning have been associated almost exclusively with cooked meats, pies, stews and stocks—in fact, any meaty food which may have been kept for a long interval between cooking and consumption, especially if the foodstuff has been kept warm or has been reheated. *Cl. welchii* is widely distributed in nature, it occurs in soil, and in animal and human fæces. Contamination of a foodstuff is often attributable to faulty hygiene; since, however, the spores are resistant to boiling and to many cooking processes, it is difficult to preclude all risk of contamination.

One of the most valuable attributes of nisin is its inhibitory effect on clostridia, which means that any foodstuff containing nisin for the control of a specific type of spoilage will also be proof against the risk of toxin production by *Cl. welchii* and related strains.

NISIN LEVELS AND PERSISTENCE

The levels of nisin required to control the various types of clostridial deterioration in processed cheese are now established within broad limits, the range being 80 to 150 Reading units of nisin per gram (2 μg. to 3·75 μg.) but evidence is accumulating that in some circumstances as little as 40 units (1 μg.) may be effective.

Knowledge of the nisin levels required in other products is still very limited, but it seems a reasonable generalisation to assume that clostridia and thermophilic bacilli (flat-sours) can be controlled by concentrations between 40 and 200 units (1 p.p.m. to 5 p.p.m.). Lewis and associates[53] have recently produced experimental evidence that even 10 units (0·25 p.p.m.) may be adequate in some canning processes. This is due to the fact that nisin damages many spores, thereby lowering their resistance to heat. Previously it had been assumed by various workers that the sterility of a heat-processed pack containing nisin depended on its persistence after heat-treatment, the residual nisin destroying any spores which germinated subsequently. These observations of Lewis are, however, in accordance with some of the experimental data obtained from the Chipping Campden experiments, in which it was found that certain experimentally inoculated cans were rendered sterile even though insufficient nisin was present to survive the retorting process.

The concentration of nisin needed to control various mesophiles or to activate the thermal destruction of the spores of mesophilic bacilli still needs much further elucidation. The control of mesophiles in a complex natural environment containing nisin-insensitive and maybe nisin-destroying organisms necessitates much field investigation, but Kooy and Pette,[30] Kooy,[85] and Pette and Kooy[17] have already studied the inter-relationships of *L. plantarum* and *L. casei* in relation to the action of nisin on clostridia in Dutch cheese. A study has also been made by Hawley[16] on similar effects in processed cheese, and Galesloot[18] has examined the effects of other group-N streptococci.

The quantity of nisin which must be incorporated in a foodstuff is generally greater than the final concentration needed for bacteriological control because some allowance must be made for partial destruction in the case of such applications as cheese processing and canning. Little data is yet available in respect of canning, but an excess of 10 per cent. is usually adequate in cheese processing. The amount of destruction or inactivation depends on the nature of the substrate, as explained earlier, on the *p*H, and on the thermal cycle. The level of nisin persisting in a foodstuff also depends on the substrate and on various other factors such as *p*H, moisture content and the nature of the residual bacterial flora. In processed cheese packaged under hygienic conditions the nisin content may remain unaltered practically indefinitely; on the other hand, if the cheese is contaminated with, for instance, fæcal streptococci, the nisin may disappear quite rapidly. The limited investigations carried out on canned vegetables points to the slow disappearance of the nisin, but it would be unwise to express a firm opinion at this preliminary stage. In the case of brined and pickled products such as olives and cucumbers, it would be reasonable to expect persistence during long periods.

CONCLUSION

Nisin is the first inhibitory metabolite or antibiotic substance to be accepted by many countries as a means of controlling certain types of bacterial spoilage, and it has therefore heralded a new principle in food technology. Hitherto, in many processes, thermal treatment has been regarded as adequate or at least the most effective means at the disposal of the food processor. Losses caused by bacteria or spores resistant to the traditional methods of processing had to be accepted with fortitude. Nisin offers interesting and attractive possibilities in the control of such long standing problems and it also opens up entirely new fields of application, but much field work is needed before its full scope, as well as its limitations, can be clearly defined.

It is, however, quite apparent from the foregoing that if nisin is to be effective in many of its applications it must be used intelligently on the basis of an intimate knowledge of the microbiology of the foodstuff and of the ecological inter-relationships existing within the substrate. Herein lies the greatest safeguard against a conceivable charge of public health dangers arising from its indiscrim-

inate use. The indiscriminate and unintelligent use of nisin is most likely to lead to disappointment and frustration on the part of the user, since it is readily destroyed and its action is blocked by various micro-organisms. There is abundant evidence that nisin is effective in processed cheese only when it is processed and packaged under hygienic conditions.[32] In these respects nisin differs greatly from the broad-spectrum antibiotics such as chlortetracycline and oxytetracycline, which because of their wide range of antimicrobial activity may mask the effects of poor hygiene and poor-quality raw materials.

So far, nisin is unique in the field of inhibitory metabolites. It occurs naturally in many cheeses and in certain of the indigenous sour milks, and nisin-producing streptococci occur in milk and in the alimentary tract of cows and humans as well as in the nasopharynx. It is proteinaceous and is digested with the food in which it is consumed. It does not have a very wide anti-bacterial spectrum, and its effect in many foodstuffs depends largely on a subtle alteration in the ecological balance of the microflora, an action quite distinct from the effect of many of the medical antibiotics and one which is nearer to that of a chemical preservative.

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▶ Of the vegetable crops grown in this country, peas come second only in value to potatoes. In 1954, some 40,000 acres of peas were grown for freezing and canning, which thus accounted for a little over 20% of the total crop. These facts are revealed in the Ministry of Agriculture, Fisheries and Food Bulletin No. 81, entitled simply "Peas." (H.M.S.O., 3s.) The bulletin is chiefly for the grower, but it contains information which will also be of interest to the food manufacturer. Thus, varieties suitable for canning and freezing are listed.

"Cereal Chemistry" A New Edition

IN cereal chemistry, as in most other branches of science, human knowledge is increasing at such a rate that it is no longer possible for one man to be an authority on all aspects of the subject. It is becoming common practice, therefore, in works which attempt to cover a particular field comprehensively, to call on a number of authors to contribute chapters on subjects about which they have specialised knowledge. In their new edition of *Modern Cereal Chemistry*,* Dr. Kent-Jones and Dr. Amos have availed themselves freely of such knowledge, and great as is their own authority in this field, this new edition of an already standard work undoubtedly gains thereby.

The section on analytical procedure will be of particular interest to food scientists, as it deals very fully with all aspects of the chemical and microbiological examination of cereal products, giving details of analytical technique much more precisely than is often the case in works of this kind. This applies not only to the standard tests commonly applied to products of this nature, but also to the less common procedures of vitamin and amino acid assay.

The sections on insect and mite infestation, on animal feedingstuffs and on the nutritive value of cereals are also worthy of special mention as being of wide general interest to anyone concerned with the application of scientific knowledge to the production and preparation of foods.

* *Modern Cereal Chemistry*. By D. W. Kent-Jones and A. J. Amos, 5th edition, 1957. Northern Publishing Co., Ltd., Liverpool. Pp. 817+ix. £5 5s. net.

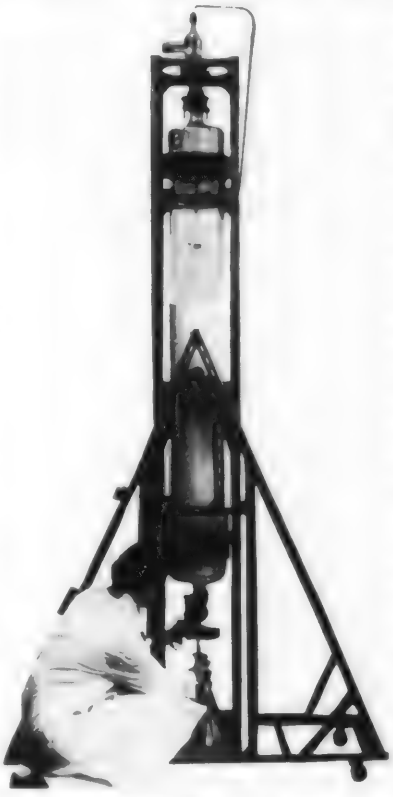
▶ "Five Million Extra Mouths to Feed" is the title of a brochure published by the South Coast Group of weekly newspapers. Its theme is the enormous market for food manufacturers in holiday resorts, particularly those in South East England. Extra visitors to these towns from June to September vary from 45,000 in Bexhill to 1,600,000 in Eastbourne.

Extra Facilities for Baking Research

B.B.I.R.A. HOLDS OPEN DAY

THE British Baking Industries Research Association gave evidence of its increasing scope and influence in the industry at the official opening of its new Bostock Memorial Laboratory. Named after Mr. Alfred Bostock, a former President of the National Association of Master Bakers, Confectioners and Caterers, and one of the men chiefly responsible for the development of the Research Association, the new laboratory has been designed and constructed as an extension of the Association's facilities at Chorleywood. Its opening by Mrs. Bostock was made the occasion of an Open Day, on which members of the Association and the general public were able to inspect the laboratories and discuss the work of the Association with members of the staff.

Several problems of great importance to the baking industry are currently being investigated. In the more fundamental field, studies are being made of the mechanical properties of doughs and of the physical structure of baked products. Work is also in progress on a scheme to isolate and identify the natural lipides of flour, which have recently been shown to have a marked influence on its baking properties. Attempts are continually made to correlate laboratory findings with results obtained in actual baking tests, so that the work does not become too academic.



Above: **Equipment for the solvent extraction of lipides from flour.**
Below left: **Samples of confectionery being removed from an experimental frozen storage cabinet.**
Below right: **The volume of a whisked egg and sugar mixture being tested to assess the suitability of the egg for use in cake-making.**

On the more immediately practical side, a good deal of attention is being given to methods of preventing spoilage. The practice of pre-packaging confectionery in cellulose wrappings, though hygienically sound, may increase the tendency of products to become mouldy, and methods of combatting this effect are being studied. Bakery materials are particularly prone to insect infestation, and the Association gives much advice to its members on insecticidal and preventive measures.

An exhibit commanding much attention in the pilot-scale bakery was a prototype continuous mixer. Designed to eliminate product variation arising from batch mixing, this experimental mixer works on the principle of the old Scotch barm process, combined with a "no-time" dough. The flour and a fermented yeast liquor are fed automatically into the mixer, and the dough is extruded continuously. A controlled amount of soft fat can also be added if desired. The mixer has been used successfully for the preparation of bread and biscuit doughs and various cake batters.

Advances in Food Technology

TOMATO PRODUCTS

Colour Deterioration

Deterioration in colour has always been a problem in the processing of tomato products, and colour estimations have become an important part of the quality-grading of these commodities. Little distinction is usually made, however, between the colour deterioration due to loss of natural pigments and that due to the introduction of off-shades by such reactions as non-enzymic browning.

Work is now being carried out in an attempt to assess these factors separately, and results already show that the temperature of processing, the availability of oxygen and the intensity of light are important factors in the rate of destruction of *lycopene*, the chief natural pigment of tomatoes.—Σ. R. Cole and N. S. Kapur, *J. Sci. Food Agric.*, 1957, **8**, 360.

SPICES

Cold Sterilisation with Ethylene Oxide

According to workers at the Federal German Meat Research Institute, Kulmbach, an effective means of sterilising spices is with ethylene oxide. This substance is said to penetrate spices easily, even when packaged; it does not impair the quality of the spice but effectively destroys micro-organisms and spores. However, certain rules must be strictly observed. The best treatment is to apply the gas in a concentration of 500 cu. cm. per cu. metre in a vacuum which is gradually reduced from 95 to about 20% over a period of 6 hr. With this treatment, spices are rendered almost germ-free without any marked decrease in colour and seasoning power. No attempt should be made to obtain 100% sterility by increasing the gas concentration or prolonging the treatment beyond the values quoted as this would affect the quality of the spices treated. Spices sterilised by ethylene oxide in the proper way can be regarded as toxicologically harmless, as the gas can be completely removed from the spice after careful airing.—K. Coretti, *Die Fleischwirtschaft*, 1957, **9**, 183. *See also* H. Rauscher, G. Mayr and H. Kæmmerer, FOOD MANUFACTURE, April, 1957, p. 169.

GRAIN

Insect Control

Much of the damage to stored food grains in India is caused by the *Khapra* beetle which is sometimes deliberately introduced into the grain by the producers to keep off other insects. This causes heavy damage when the grain is subsequently stored in jute sacks.

Investigations by the Central Food Technological Research Institute at Mysore showed that the impregnation of jute bags with lindane synergised with a vegetable oil protected grains for 8-10 months. However, it did not destroy the insects infesting the grain at the time of storage. Injection of the bags with volatile chemicals, particularly ethylene dibromide, proved very successful in checking infestation. Ethylene dibromide was absorbed on inert materials, *e.g.* chalk sticks, and two such sticks, each holding about 4 ml. of the chemical introduced into each bag. The method was tried successfully on a commercial scale.

The control of *Khapra* in warehouses was achieved by the use of detergents in the emulsion of the insecticides used for spraying the grubs. Lindane emulsion (0·01%) or dieldrin emulsion (0·05%) mixed with turkey red oil (1·0%) destroyed the grubs in 6-8 days.—V. Balu and S. V. Pingale, *J. Sci. Industr. Res.* (India), 1956, 15A, (9) 403.

FISH

Measurement of Rancidity

A method for the determination of oxidative rancidity in fish products has been developed, based on the 2-thiobarbituric acid test. The procedure has been tested on fish meal, fish oil, fresh and frozen fish, and the results obtained have been correlated with the results of organoleptic tests. One of the chief advantages of this method is that it can be performed on an intact sample and thus eliminates the necessity for involved extraction procedures.—T. C. Yu and R. O. Sinnhuber, *Food Technol.*, 1957, **11**, 104.

MEAT

Bacteriological Sampling

Bacteriological examination usually involves the removal of part of the surface from fresh meat. Distribution of micro-organisms on the surface of meat is never regular, and the removal of the large numbers of samples necessary to get a true bacterial count involves down-grading the meat.

In the method discussed, sterile millipore filters were damped and then pressed against the surface of the meat to be sampled, being held there for 1 min. The filters were then shaken in sterile distilled water for 2 min., the resultant liquid being plated out by conventional methods.

Comparison was made between the millipore and plug methods of sampling meat. It was found that the millipore method yielded a lower count than the plug method. While there was no practical significant difference between the two methods the millipore procedure was stated to have made bacteriological studies more feasible from the aspect of economy.—J. H. Silliker, H. P. Andrews and J. F. Murphy, *Food Tech.*, 1957, **11**, 317.

Machinery and Equipment

VIBRATING SEPARATOR

Although their chief interest has previously been in the ceramics industry, Wm. Boulton, Ltd., have introtroduced a screening and filtering machine which they hope will find many applications in the food industry. The machine works on the principle of a vibrating screen (or series of screens), to which vertical and horizontal oscillations are applied. The net result is that a swirling motion is imparted to the material to be treated, and it is claimed that this materially increases the speed and efficiency of separation.

Dry materials such as flour or a variety of substances in suspension in water can be handled by the machine. The screens may be of phosphor bronze, silk or stainless steel to suit individual requirements, and four screen sizes, ranging from 8 in. to 44 in. dia., are produced. Over-size material may be discharged at the side of the machine, or, where the proportion of oversize material is low, the machine may be run on a batch system.

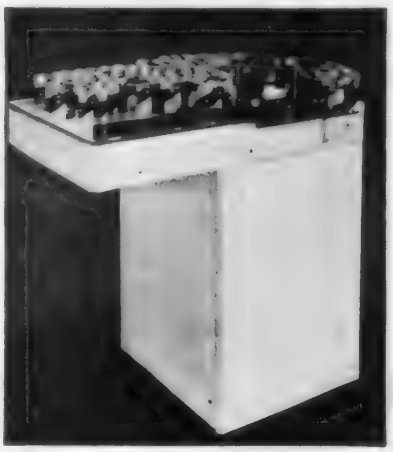
Screen meshes on this machine are designed to suit particular requirements.

UNSCRAMBLING TABLE

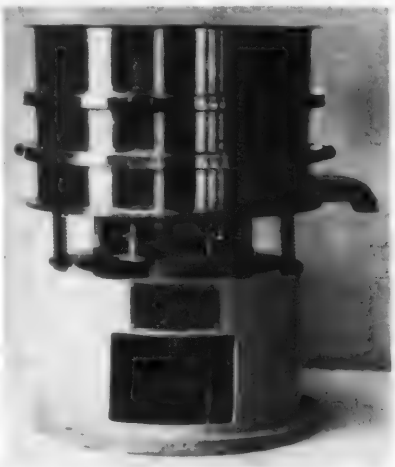
An *Unscrambling Table*, has been introduced by Autopack, Ltd., to keep a steady flow of small bottles, vials, drums, etc., moving to automatic weighing and packing machines. The unit is made up of a loading platform, a circular table which will marshal the containers into the required pattern, and take-off points which feed conveyors.

The loading station is on the same level as the circular table, and after containers have been placed on the loading station it is merely necessary to push them forward on to the revolving table. The containers are then carried round until contact is made with the two spring arms mounted on a bracket, which allows for considerable adjustment in the feed of the containers to the perimeter of the table where they are retained by a guide rail. Containers surplus to the feed requirement of the packing machine push past the spring arms and make further circuits of the table until required.

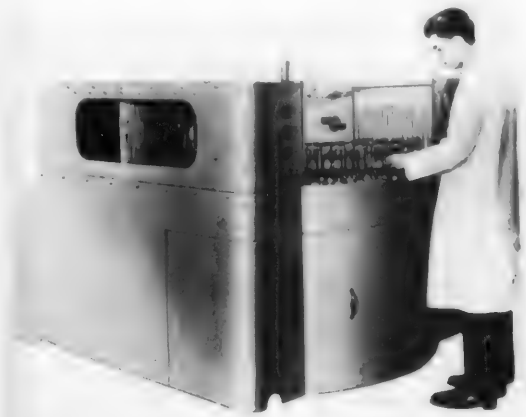
The use of the *Unscrambling Table*, the makers claim, ensures an even flow of containers to the packaging machine, and by means of the spring control which automatically compensates for the load of containers on the table one can be arranged to feed two packaging machines with containers.



Autopack's "Unscrambling table."



New vibrating separator for the food industry.



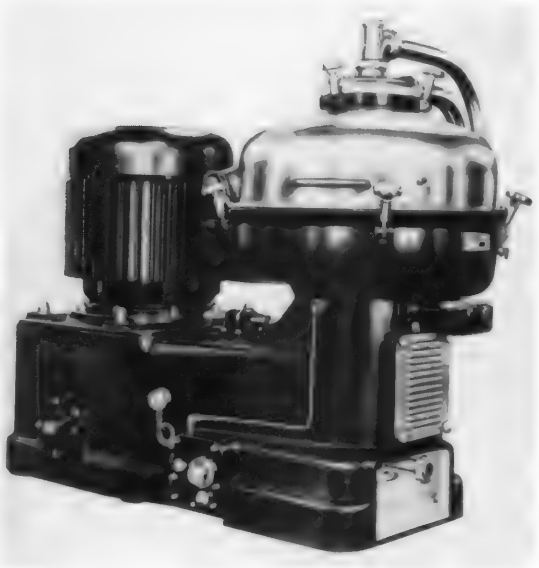
This new "Grangemouth" hydro bottle cleaning machine will be showing at the Brewers' Exhibition at Olympia (September 30 to October 4). Its output is up to 240 doz. bottles per hr., according to the makers, Thos. Hill Engineering Co. (Hull) Ltd.

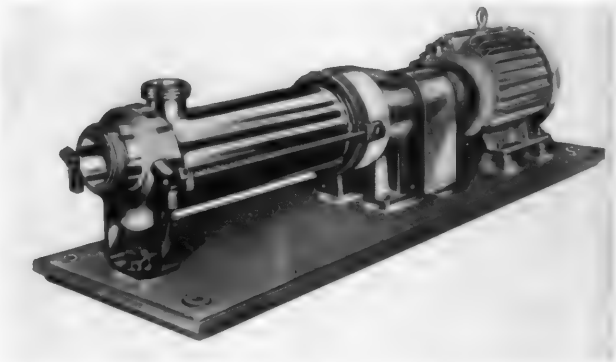
FLAME-PROOF EQUIPMENT

A number of flame-proof products have been introduced by Evershed and Vignoles, Ltd. They include float-operated, level alarm switches in different versions suitable for fitting to pressurised and other tanks. The use of magnetic linkage dispenses with the need for glands, thereby overcoming difficulties with respect to spindle friction and leakage. The high level alarm switch type PV.74 (flame-proof to BSS.229 for Group II gases) is designed for non-pressurised storage tanks, whilst the level alarm switch type ERS.55 is suitable for working pressures of up to 500 p.s.i. and is similarly flameproof for Group II gases.

A particularly interesting type of relay is the Evershed type LR.134. The characteristics of the initiating circuitry of this relay meet the requirements of intrinsic safety, and the auxiliary power relays are contained within a flame-proof casing, which is Buxton certified for Group II gases. Although the case is of moderate size, the switching capacity of the unit is 440 volts at 5 amperes, and it is therefore suitable for an exceptionally wide range of duties.

Evershed flame-proof junction boxes are available to match the electrical equipment and are considerably smaller than similar units designed for light or power applications. They are also claimed to offer distinct advantages where single boxes are required,





Two food machines now being shown at the Engineering, Marine, Welding and Nuclear Energy Exhibition at Olympia. *Left:* **A "De Laval" nozzle separator suitable for starch and gluten separation, fish oil separation, etc.** *Above:* **Mono Pumps' new "Kwikleen" pump designed for quick and easy cleaning.**

as they are arranged to be easily fitted in different locations. The junction boxes are available with 3, 6 or 12 terminal blocks, all constructed in aluminium silicon alloy with steel inserts in the cover screws etc. They are certified flame-proof for Group II gases.

Alarm cancellation switches, which were specially developed in conjunction with certain comprehensive warning installations in major process plants involving hazardous operating conditions are also available. These switches are flush mounting, push button automatic resetting type, and are also Buxton certified for Group II gases.

EASILY CLEANED PUMP

A new hygienic pump made by Mono Pumps, Ltd., is shown at the Engineering and Marine Exhibition (August 29 to September 12). The pump, the *Mono Kwikleen* K63, is available to demonstrate the quick method of dismantling for sterilisation, stripping being carried out by two simple operations. All internal surfaces are of polished stainless steel and the stator is of non-contaminating composition. The pump is suitable for handling milk and other fluid edible products. It is self-priming up to 25 ft. and can be used for vacuum extraction duties. The makers claim that the consistent rate of discharge makes it suitable for high-temperature short-time processing. A range of these pumps is expected to be produced. The pump available has a capacity up to 3,000 gal. per hr. with a maximum pressure of 30 lbs. p.s.i. A range of their standard industrial pumps is also displayed.

Amongst other exhibits is the P12 *Mono* powder pump delivering a powder through a pipe circuit on the stand. It is claimed that very low horsepower is required to drive the pump and the use of air for fluidisation is kept within reasonable limits.

CENTRIFUGAL SEPARATORS

Among the centrifugal separators displayed by Alfa-Laval at the Engineering, Marine, Welding and Nuclear Energy Exhibition is the automatic self-opening separator. By means of a special hydraulic device, solids are ejected from the centrifuge bowl while it is running at full speed, thereby eliminating any shut-downs for bowl cleaning. Alfa-Laval say this machine is now widely used for oil purification, clarification of beer wort, molasses, etc.

The *De Laval* nozzle separators for continuous 2-way and 3-way separation are represented by two machines, the larger of which is driven with a 65 h.p. motor and can handle up to 80 tons of liquor/hr. These machines are suitable in starch factories for starch separation and concentration, and gluten separation. They are also used for such problems as fish oil separation.

The *Desludger*—the horizontal centrifuge—for continuous solids separation, as well as a comprehensive range of standard machines, may also be seen. Other *De Laval* equipment includes plate type heat exchangers in stainless steel construction, and stainless steel centrifugal pumps.

AUTOMATIC PASTEURISER

The latest model of the *Briggs* automatic vapour pasteuriser which will be shown at the Brewers' and Allied Traders' Exhibition at Olympia (September 30 to October 4) is said by its makers to incorporate several new features.

The machine, which has electronic control, utilises what is claimed to be the fastest heat transfer by the latent heat of steam brought about by injecting live steam into air which becomes saturated water vapour at a required temperature.

Heat is applied to the bottom of the bottles or cans to be processed; by this means the normal conventional movement caused by the heating of liquid is accelerated. Cooling is achieved by using finely divided water sprays which employ the principle of cooling by evaporation.

The machine which is being exhibited is a single tier model designed for the pasteurisation of beer, fruit juices, cider, pickles and sauces.

DEFROSTER

A description of the *Holroyd* defroster for large refrigerators and cold rooms is contained in a report by the Eastern Gas Board.

The defroster is essentially an enlargement of the cooling coil mounted outside the cold room and operates by applying heat to the refrigerant.

The appliance is gas powered, the burner equipment comprising two rows of miniature jets with a cross lighting jet between them. The gas consumption might possibly be 20 therms a year when defrosting the coils of 1,000 cu. ft. capacity every day.

Other advantages claimed for this equipment which is made by John Downton (Electric), Ltd., are that there is a negligible rise in the cold room temperature; perfect refrigeration is maintained and the bloom is kept on meat which might otherwise be lost if the meat were taken out for any length of time.

The report goes on to say that installation is simple and inexpensive and operation and maintenance are easy.

Further information on the plant and equipment described in this section may be obtained by writing to FOOD MANUFACTURE'S *Information and Advice Service, Stratford House, Eden Street, London, N.W.1.*

News Digest

Progress Reports on Food Research

Two reports have recently been published which are of major importance to food manufacturers—the annual report of the **Department of Scientific and Industrial Research**, and the Report of the **Food Investigation Organisation.** Between them, the reports cover in detail the activities throughout the past year of the various Government-sponsored organisations engaged on research on food products.

The D.S.I.R. report gives news of many research projects which are under way throughout the country. The **Research Association of British Flour-Millers** has continued work on the nutritive value of flour, and has shown the high value of proteins from this source when used in conjunction with small amounts of lysine-rich proteins from other sources. It has also been shown that the extraction rate is of little significance in this respect. From the **British Baking Industries Research Association** comes news of continued research on the "checking" of biscuits, a problem of importance to both the home and the export trade. Work by this association on the frozen storage of flour confectionery has also yielded valuable results, and it has been shown that at −5°F. many types of goods can be stored perfectly for seven days, and sometimes for considerably longer.

The **British Food Manufacturing Industries Research Association** has continued work on a wide range of foodstuffs, and has recently established a Liaison and Advisory Unit with the specific task of helping food manufacturers—particularly those who do not employ a chemist or technologist—to take full advantage of advances in food technology.

The report of the Food Investigation Organisation makes it clear that two topics of exceptional interest have come to the forefront—the potential applications of antibiotics in the preservation of food, and the possible use of ionizing radiations for a similar purpose. Studies on the preservation of fish have shown that the use in ice of about 5 p.p.m. of chlortetracycline (aureomycin) materially increases the storage life of fish packed in it. Encouraging results have also been obtained on the preservation of eviscerated poultry with this antibiotic.

"War on Corrosion"

Press correspondents and other guests at a reception held last month to announce plans for National Anti-Corrosion Week, October 14 to 19, were greeted by Lewis Carroll's White Knight (alias Mr. Ernest Hill, manager of *Chemical and Process Engineering*), whose design to "save the Menai Bridge from rust by boiling it in wine" is justly famous.

More scientific and often scarcely less novel methods of corrosion control and prevention will be examined during the two chief events of National Anti-Corrosion Week: a Convention at which 15 experts will present papers on various aspects of corrosion technology and an Exhibition at the Royal Horticultural Society's Old Hall at which 54 firms will exhibit anti-corrosion products and services. The exhibition will be opened by Mr. Harmar Nicholls, M.P., Parliamentary Secretary to the Ministry of Works, who will also be guest of honour at a dinner to be held for Convention delegates on October 15.

National Anti-Corrosion Week is sponsored by CORROSION TECHNOLOGY (published by Leonard Hill, Limited, who also produce 15 other journals including FOOD MANUFACTURE), the first British journal of its kind. Announcing the plans for the convention and exhibition and introducing some of the speakers, Mr. W. G. Norris, managing director of Leonard Hill, said: "We are here to declare war on corrosion. . . . Corrosion is an insidious costly evil which presents Britain alone with an annual bill of £600 million."

After Mr. Norris had outlined the events and aims of National Anti-Corrosion Week, questions on corrosion were answered by several of the convention speakers who attended the reception. Finally, guests were served with refreshments, including Corrosion Cocktails made to a secret formula!

Courses in food technology

Details of regional full and part-time courses for those in the meat, fish and milk trades are given in the 1957-58 prospectus of the National College of Food Technology. Copies are available from the Registrar of the College, Eagle Court, St. John's Lane, London, E.C.1.

Slaughterhouse standards

Detailed recommendations on minimum standards for slaughterhouses are contained in a White Paper (Cmd. 243) published recently as part of the Government's long term policy for regulating the provision of slaughterhouses in England and Wales. Minimum standards for slaughterhouses were envisaged in the White Paper published in May of last year but the necessary regulations cannot be made under existing powers and new legislation will be necessary. However, the Government hopes that the present White Paper will offer guidance to traders and local authorities who are concerned with plans to build or renovate slaughterhouses.

Scots want Hygiene Code

The Hygiene Code, promised under the legislation which came into effect in Scotland at the start of this year, is still awaited by the food trades, reports a correspondent in Glasgow. At present, the proposals are being reviewed. The ultimate draft will again go before the trade associations interested in this matter and also before the local authorities whose officials will be required to enforce the regulations. So far as can be seen it will be early 1958 before any attempt can be made to implement any regulations which emerge and this means that local authority officials will be required to continue to advise and guide rather than to apply precise regulations.

Food colours revised to meet new law

The entire range of colours made by W. J. Bush and Co., Ltd., has been revised to conform with the new Colour Regulations which came into effect on June 30, and a new price list embodying these revisions, has been published. The trade mark *Permicol* has been taken out by Bush to denote colours conforming to the new Statutory Order. Bush say that they can supply colours which meet the legal requirements of any country. For those countries where the use of artificial colours in foods is still prohibited, they have prepared the *Bonsanto* range of natural food colours, which are free from artificial dyes, toxic metals and insoluble tinting earths.

Batchelors' New Cannery

Current progress at Batchelors' new cannery at Ashford, Kent. When complete the plant will be capable of producing 1,200 cans per min. and will employ 1,500 people from the Kent area.

Flow-line fish dehydration

Plans have been prepared by Kestrel Products, Ltd., for a new factory on the outskirts of Aberdeen for the dehydration of fish, using flow-line processing. A small pilot plant has been in operation for the last two years, and has provided the experience and data to design the production factory. Automation Consultants and Associates, Ltd., have been acting as consultants to Kestrel Products.

Although the factory is designed to handle fish, an experimental section will continue to work on meat, vegetables and fruit, and these will be marketed at a later stage.

The new factory has been designed so that the production area of the plant can be doubled or tripled at will, without affecting the operation of the rest of the plant.

Rowntrees invest £2 million on Tyneside

Early in 1958 full production is due to begin at the large new factory of Rowntree and Co., Ltd., at Fawdon, Newcastle-on-Tyne. Begun in August, 1955, the factory occupies a site of some 25 acres, of which 6½ acres will be covered by buildings. It has been designed for the production of fruit pastilles and jellies, and constructed with the aims of hygiene and cleanliness particularly in mind. The seven production bays are constructed of shell concrete supported by tapering columns, the roofs rising to north light glazing. No beams protrude below the curved ceiling, and the fluorescent lighting tubes, placed in recesses, are accessible from outside for maintenance. The factory was designed and built by Messrs. Laing, in consultation with Rowntree's own architectural and engineering staff.

In staffing the new factory, wide use is to be made of local labour. Some 12 key personnel, including a young managerial team, will be transferred from the firm's parent factory at York, but it is hoped to recruit about 600 men and 300 women, and to fill about 40 positions of responsibility, from the local labour force. The factory manager will be Mr. M. W. Jones, who has been engaged on personnel work at the York factory.

The cost of constructing the factory will reach about £1 million, and a further £1 million is to be spent on machinery and equipment. In addition, a large landscape garden, including ornamental pools and rockeries, is to be laid out along the full length of the south side of the factory. This has been designed by Mr. Brian Hackett, a well-known landscape architect and a lecturer on the subject at the University of Durham.

Welfare buildings for Wall's workers

Two new welfare blocks are being built by Wall's at their ice-cream and meat-products factories at Godley, near Hyde, Cheshire and at their meat products factory at Willesden, London.

The Godley building is a 5-storey block erected at a cost of £300,000 and includes a canteen, a testing laboratory, office accommodation and a medical department with facilities for carrying out X-rays and chiropody. It will come into operation very shortly.

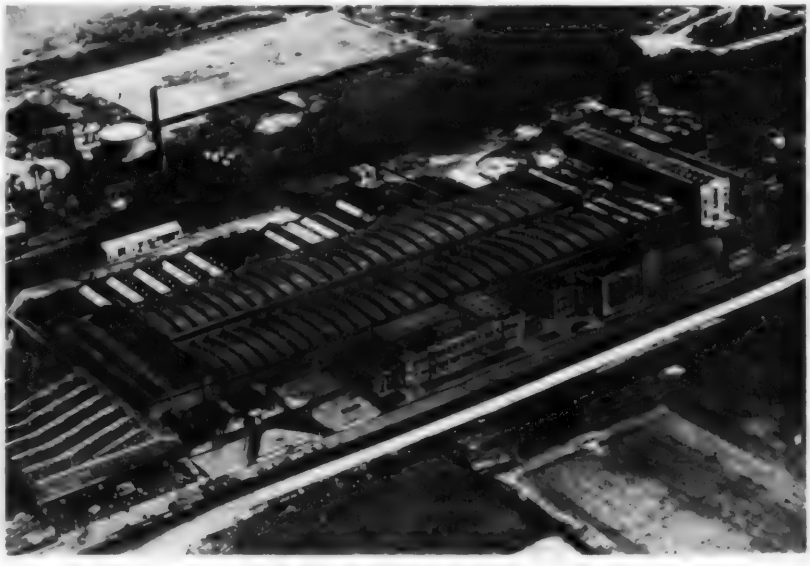
The new block at Willesden includes a demonstration shop for training meat-products' salesmen and a staff shop where employees will be able to buy the firm's products. It will also house staff canteens and executive dining rooms, locker rooms, lavatories and shower baths. It is expected that the block will be completed by August, 1958.

Bakery taken over

The old-established bakery firm of B. Pooley and Son, Plymouth, has recently been acquired by C. A. and W. Goodbody, Ltd., who were themselves acquired in 1954 by the Wales and South-Western Bakeries, Ltd., a subsidiary of Allied Bakeries, Ltd.

The business was founded by Mr. Benjamin Pooley in 1892, and owns 10 shops in Plymouth. Before the war they had 18 shops, several of which were destroyed by bombing.

Mr. Gordon Pooley, a Plymouth J.P., entered the business in 1911 and became managing director on his father's death in 1938. He is a past-president of the Master Bakers' Association.



Van den Bergh's Extensions

Van den Bergh and Jurgens, Ltd., the largest manufacturers of margarine and cooking fats in Gt. Britain, have announced a £3½ million four-year plan to streamline and extend their Bromborough (Cheshire) works. This picture shows an artist's impression of the new works. The reconstructed factory will be covered with a Silberkuhl roof supported by a series of 120 ft. span arched steel frames with vertical windows facing north. A new office block, canteen, a modern health centre and improved recreational facilities will be provided.

Erections and Extensions

Crown Macaroni Ltd., are having a new factory erected at Welwyn Garden City,, Herts.

■

Campbell's Soups, Ltd., are having a factory erected at Hardwick Road, Kings Lynn, Norfolk.

■

Hammond's Sauce Co., Ltd., are planning to extend their factory at Dockfield, Shipley, Yorks.

■

Work has started on extensions to the factory of **Lucozade, Ltd.**, at Vicars Lane, Newcastle-on-Tyne.

■

T. Wall and Sons (Ice Cream), Ltd., are having a depot erected at Glaisdale Drive, Nottingham.

■

Neilson's Ice Cream Co., Ltd., have opened a new factory and depot in Mighell Street, Brighton, Sussex.

■

A new meat products factory has been established at Laighstonehall, Scotland, by the **Hamilton Central Co-operative Society.**

■

United Glass Bottle Manufacturers, Ltd., are having extensions built to their factory at Glasgow, at an estimated cost of £20,000.

■

The **Herring Industry Board** has had plans prepared to build a herring reduction factory at Mallaig, Inverness, Scotland.

■

W. MacCarthy and Sons, Ltd., cardboard box manufacturers, are extending their factory at St. James' Road, London, S.E.1.

■

H. J. Heinz and Co., Ltd., have had plans approved for extensions to their warehouse at Waxlow Road, London, N.W.10.

■

Thomas and Evans, Ltd., soft drink manufacturers, are having a depot built at Crawley, Sussex, at an estimated cost of £10,000.

■

W. H. Marriage and Sons, millers, have had plans prepared for the erection of extensions to their grain storage buildings, at Chelmsford, Essex.

■

Chambers Wharf and Cold Stores, Ltd., London, S.E.16, have had plans prepared for the early erection of extensions to their riverside jetty and for the future expansion of their cold storage capacity and warehouse accommodation.

Metal Box in Baker Street

The Metal Box Co., Ltd., are now firmly established in their new head office at 37, Baker Street, London, W.1, and recently held a cocktail party when guests, including FOOD MANUFACTURE, *were able to see over the premises. The seven-storey building embodies some of the most modern innovations, from an underground car park to air-conditioned lifts equipped with telephones. A telecommunications centre connects the office to the company's 48 factories, depots and offices in the U.K., 6 subsidiary companies in the Commonwealth, 11 associated companies in Europe, the Middle East and the Southern hemisphere and correspondent companies in North America. A remote control dictation service operates inside the office. The Canned Foods Advisory Bureau has its offices in the same building and a self-service store is run on the ground floor. Pictures show (above) an artist's impression of the new building. (Below) the self-service store, showing the arrangement of gondolas which are at angles to the side walls.*

U.G.B. raise prices

United Glass Bottle Manufacturers, Ltd., have raised the prices of their glass containers by approximately 7½%. The former prices had been stable since October, 1955.

Change of address

Ivers-Lee (G.B.), Ltd., packaging specialists have moved to their new factory. Their address is now 225, Bath Road, Slough, Bucks. (Telephone: Slough 21234.)

PEOPLE

LORD TWEEDSMUIR has been appointed a director of Bovril.

▪

MR. J. L. WOOLLETT has been appointed manager of the London Branch of the Telegraphic Construction and Maintenance Co., Ltd. MR. F. T. WALKER takes his place as manager of Telcon's Nottingham branch.

▪

MR. J. W. COLE, joint managing director, and MR. W. F. A. THORPE, chief chemist, of Arthur Holden and Sons, Ltd., have just returned from a visit to U.S.A. where they have concluded arrangements for the mutual exchange of formulations, technical information and "know-how" with the Midland Industrial Finishes Co. of Waukegan, Ill.

▪

New executive appointments at T. Wall and Sons (Ice Cream), Ltd., follow the transfer to a senior position with an associated company of MR. J. P. MEADOWS, commercial director.

MR. W. H. HARRIS, chief accountant, is appointed planning officer. MR. F. T. PEARCE succeeds Mr. Harris as chief accountant, and MR. J. H. E. SPINK joins the Park Royal Headquarters in charge of accounting matter. MR. J. A. A. BEER, marketing director, will be the board member responsible for marketing, advertising and sales administration. MR. J. G. SHORT, sales director, will be responsible for the company's national customers, for specialist sales activities, refrigeration and transport.

▪

MR. J. S. HARPER has been appointed manager of a new office which Mono Pumps, Ltd., have opened in Belfast. Mr. Harper has represented Mono Pumps in Northern Ireland for a number of years and is well known to the company's customers there.

The opening of the new office has provided more adequate storage facilities enabling the company to provide a spares service.

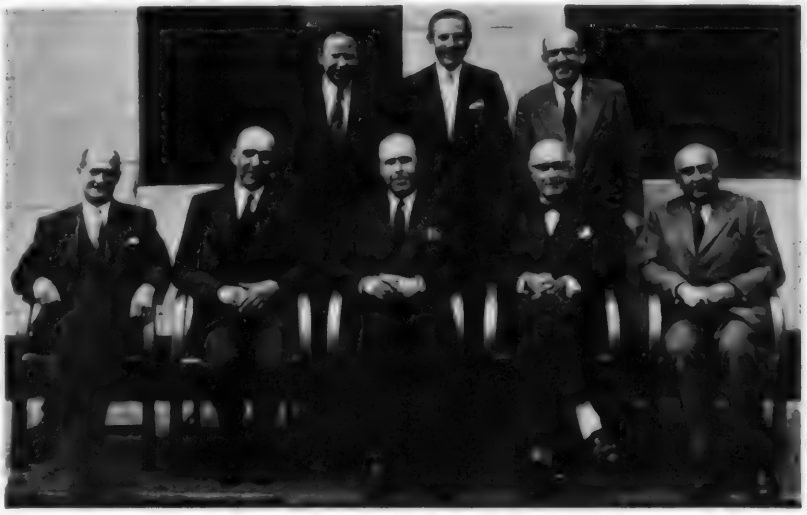
▪

Obituary

MR. ARCHIBALD REILLY, who represented Lautier Fils in Scotland for nearly 20 years, died suddenly on August 7.

▪

MR. F. G. BLOMFIELD, chief planning engineer of the A.P.V. Co., Ltd., died on August 4. He was 61 years old and had served A.P.V. for 38 years. He died at his home in Burgess Hill and was cremated on August 8 at Brighton. The wreaths indicated the respect with which he was held in the dairy industry and many were from other dairy engineering companies associated with him in his work.



Bush "Commonwealth Conference"

Managing directors of W. J. Bush companies in the British Commonwealth met at Ash Grove headquarters in London recently to discuss general policy with the chairman and directors of Bush U.K. Seated (left to right) are H. W. Vernon, C. F. Bush, E. L. Bush, A. J. McIntyre, C. R. Woods. Standing (left to right), P. J. White (South Africa), R. W. Jennings (Canada), J. A. D. Paul (Australia).

MR. J. BAMFORD, secretary and chief accountant of Batchelors for the past 12 years, died at Sheffield on July 30.

An infantryman in World War I, he joined the Southern Whaling and Sealing Co. in 1922 and served on an Antarctic whaling station for a year. Later he was with the Premier Whaling Co. in South Africa as secretary, afterwards returning to his former company as secretary and chief accountant. In 1939 he was seconded to the Ministry of Food as joint manager of the Whaling division.

From 1911, when he joined Unilever until 1945, when he went to Batchelors, he was with companies within the Unilever concern.

▪

MR. FRANK NUTTER HEPWORTH, C.B.E., a former chairman of the Metal Box Co., Ltd., died at Carlisle on June 14. He was 85.

Mr. W. Leonard Hill, founder of FOOD MANUFACTURE and chairman of Leonard Hill Limited, who was well acquainted with Mr. Hepworth, before and after the formation of Metal Box Co., Ltd., writes: "Frank Hepworth was largely responsible for the formation of the Metal Box Company and was elected the first chairman of the combine in 1921. At one time he was leader of the employers' side of the industry's wages council and president of the British Tin Box Manufacturers' Association. I recollect very pleasant contacts with this distinguished leader of industry."

Mr. Hepworth started his career at the age of 17 with Hudson, Scott and Son, the Carlisle tin box manufacturers, and subsequently became chairman of the firm. He was known as a benefactor of the arts and a keen and active supporter of the interests of young people. He became a J.P. for Carlisle in 1927 and for a long time was chairman of the juvenile court there. In 1946 he was made C.B.E.

▪

Seasonal sausage casings

Specially printed *Hypak* casings for sausage meat packs are offered by the Oppenheimer Casings Co., Ltd., for the Christmas trade. Orders for these must be placed before September 30.

▪

"Instrumentation for Refrigerated Food Storage"

In the article of the above title published in our July issue (p. 328) the text referred to the Elliott resistance thermometer in Fig. 2 as "approved by Lloyd's Register." We have been asked by the makers, Elliott Brothers (London), Ltd., to state that, although they supply an electrical resistance thermometer which has been approved by Lloyds Register, this is different from the design as shown in Fig. 2. Satisfaction of Lloyd's requirements involves not only a thermometer of special design but also a special type of indicator operating on the null balance principle. The illustration shows a type of thermometer now developed by Elliott's especially for use in grain silos. The question of Lloyd's approval has never arisen in connection with this design.

Company Profits and Prospects

"600" profits reach £1 million

Combined net profits for the George Cohen 600 group for the year to March, 31, were £1,097,686, compared with £889,991 in 1956.

Tea dividend up

Although group trading profits of International Tea Company's Stores rose to over £2 million last year, after heavier tax, depreciation and pensions, the net profit is little more than £38,000 higher at £671,563 (£633,242).

The company has raised its annual dividend from 15% to 17½% with a final of 12½%.

Larger stainless steel output

Orders for stainless steel equipment which were cancelled at the time of the Suez crisis are already being reinstated in the order book and the outlook for the future is very promising according to the annual statement issued by the chairman of W. P. Butterfield, Ltd. Net profit for the year was £92,596 compared with £86,868 in the previous year.

Energen's "unprecedented demand"

A new oven capable of producing enough *Energen* rolls in a 5-day week to fill 90,000 cartons has been installed at Energen Food's Ashford, Kent factory. Announcing this at the company's annual meeting recently, Mr. W. H. Bennett, chairman and managing director, spoke of "unexpected and unprecedented" demands for *Energen* rolls last summer.

The consolidated profit before taxation amounted to £105,444, against £76,056 for the previous year. A final dividend of 12½% making a total of 20%, was approved.

First Hovis-McDougall accounts

The first accounts of Hovis-McDougall, Ltd., since the merger of the Hovis and McDougall businesses were presented by Mr. Kenneth Moore, chairman of the company recently. He emphasised that they covered a broken and difficult period (the group's financial year closes on March 31, 1958) and were "not fully representative."

Substantial sums have been written off wheat stocks in spite of the building up of large reserves during recent years, and profit margins in the bakers' white flour section of the Hovis business fell "almost to vanishing point" after the removal of the bread subsidy. However, sales and profits of *Hovis* and *McDougall's Self Raising Flour* were well maintained.

A final Ordinary dividend of 7½% for three months to March 31, instead of for six months to June 30 was made.

OBITER DICTA

● Sugar is the food of thought. —*Mr. Walter Elliot, M.P.*

● I think there can be no question but that it is easier to learn how to cook soup than to live on a State farm.—*Mr. Khrushchev.*

● The best drug for the relief of pain is alcohol—and I don't mean anything pharmaceutical but whisky!—*Prof. Charles Robb, Professor of Surgery, London University.*

● A lady we know broke open a rice cookie at a Chinese restaurant on Broadway and found this message on a slip baked into the pastry: "To halt juvenile delinquency . . . BIRTH CONTROL."—*New Yorker.*

● Back home I plug a breakfast cereal. But even my kids won't eat it. I also plug a hair oil which sells very well because it's also a marvellous salad oil. —*Al Capp, American cartoonist and T.V. entertainer.*

● When I became a judge, I thought that whenever I had a judgment to write I would write it with a bottle of port at my elbow. But I gave it up—it spoiled the port.—*Lord Chief Justice Goddard.*

● Should you go to France and marvel at the flavour of *mouton de prés salé*, the answer is that the sheep graze on fields which have been covered by sea. This meat, served with potatoes and flageolet beans, is a famous Breton dish.—*Daily Telegraph.*

● Lights up, an' three sellin' sessions a night we 'ave at our shop, an' if t' takings is bad early on, I'm down to that boiler house, stuffin' on coke till t' customers are fair cookin'! Ice-cream sells fast enough t' second time round!—*Northern cinema manager reported in Manchester Guardian.*

● I was interested to see the appearance of electronics on several stands at the recent New York Hotels show. One impressive demonstration showed how a cold joint could be warmed up in a few seconds by placing it in a high frequency oven. As a consumer I came away with mixed feelings. — *Sir Walter Puckey.*

News for Importers

Fresh citrus fruit and canned grapefruit.—The Board of Trade will license the import of a further $1·85 million worth of fresh oranges, lemons and grapefruit, and $350,000 worth of canned grapefruit from the U.S. Purchase will be made with dollars available under the Agricultural Trade Development and Assistant Act.

Similar quotas were announced in February, 1956, for citrus fruit and in June of the same year for canned grapefruit.

Almonds.—The Treasury have made the Import Duties (Drawback) (No. 12) Order, 1957, which reduces from 66s. to 35s. per cwt. the rate of drawback allowable in respect of Customs duty paid on unblanched shelled almonds used in the manufacture of certain descriptions of exported blanched almonds. The Order has been published as Statutory Instruments 1957, No. 1288.

Sperm oil imports.—The Treasury have announced that the Import Duties (Exemptions) (No. 9) Order, 1957, by which unrefined sperm oil is exempted under the Import Duties Act, 1932, will remain in force up to the end of this year.

The Order came into operation on August 1 and has been published as Statutory Instruments 1957, No. 1317.

Raw coffee beans.—The Board of Trade have announced the renewal of the import quota for raw coffee beans from dollar sources. During the year ending August 31, 1958, raw coffee beans to the value of £3 million may be imported from these sources against last year's quota of £2·5 million.

Full details are given in Notice to Importers No. 831 issued by the Import Licensing Branch of the Board of Trade.

Imports from Argentina.—The Board of Trade has announced that the Open General Licence has been amended so as to allow the import of dried fruit, canned and bottled fruit, and canned ham from Argentina.

Fresh apples and pears remain on quota at the same figure for the year up to June 30, 1958, as for last year (£650,000 f.o.b.).

Argentina has been added to the list of countries from which chocolate and sugar confectionery may be imported, subject to quota.

Full details are given in Notice to Importers No. 830, issued by the Import Licensing Department of the Board of Trade.

Cheaper fats from CBC

Craigmillar and British Creameries, Ltd., have announced price reductions of from 2s. to 9s. per cwt. for all their bakery and ice cream margarines. *Covo* all-hydrogenated shortening, and *Hyvo* for high sugar cakes, are both reduced by 5s. per cwt.

Food News Overseas

Israel sugar cane planting

Some 2,500 acres of sugar cane are to be planted in the Beisan valley in Israel with a view to supplying the Affoula refinery in two years' time.

CO_2 kills whales in two seconds

A new Norwegian invention for hunting whales using carbonic acid will now be tried out in practice in whale hunting around Iceland. The new idea, experimented with by the Norwegian engineer C. U. Wetlesen, is that when the harpoon hits the whale the shell releases 2·5 cu. metres of CO_2, which spreads through the whale's body and kills it in two seconds. It then causes the whale to float up to the surface without air having to be pumped into it, as is the present method.

Greek fruit exports

The Greek Ministry of Commerce have announced that consideration is being given to the establishment of a special Greek office in Munich which would co-ordinate the export of spring fruit to Western European countries. Greece would, it is reported, be ready to provide up to a hundred refrigerated railway wagons in order to speed up deliveries.

First Greek sugar refinery

It was recently decided by the Greek Ministerial Economics Committee to establish the first sugar factory in Greece (near Larissa) with a daily processing capacity of 2,000 tons of beet. The factory, which will produce some 2,000 tons of sugar a year and will cover about one-third of the country's sugar requirements, will, it is calculated, save annually about $4,000,000 in foreign exchange, and will provide employment for 450 persons throughout the year, apart from giving a boost to seasonal agricultural employment. The establishment of other sugar factories will be considered later.

Indian mills use British plant

Two new flour mills designed and equipped by a British company, have started up in India. They are the Century Flour Mills of Madras and Bharat Flour Mills of Pathankot. They have been equipped with *Pneu-Flow* pneumatic conveying and gravity flow equipment made by Thos. Robinson and Son, Ltd. At Century Mills, the pneumatic screen room has been remodelled, and the Robinson milling plant installed there in 1955, has been augmented by a new milling plant. Robinsons say that, when the new installation is in operation, the overall milling capacity will be more than doubled.

Mr. C. A. G. Aitken, a technical representative of Thos. Robinson, has gone to India to supervise the starting up of both mills.

Dominican sugar refinery

The recently completed Esperanza sugar refinery will process cane from 18,000 acres of the Cibao valley, an area of the Dominican Republic where hitherto sugar has not been grown on a large scale. The refinery is expected to produce a total of 150,000 tons in its first 1957-58 season.

Present estimates put the complete season's crop at 1,150,000 tons, a rise of approximately 10% on the 1956-57 figure.

Ghana biscuit manufacturers

A company to manufacture biscuits has been formed on the basis of an equal partnership between the Industrial Development Corporation and Edward Nassar and Co., Ltd., a large importing house in Ghana. It is named the Pioneer Biscuit Co., Ltd., and a factory is being built on the outskirts of Kumasi. All the plant has been bought from Germany and a German engineer is supervising its erection: the management, maintenance staff and master baker will, it is understood, all be German. The factory will have a capacity of five tons per day working 8 hr. shifts. It will specialise in sweet and cabin biscuits. Production should commence this month.

Colombian food prices campaign

The Colombia Cabinet has passed a resolution providing for an increase in the import of essential foodstuffs to reduce the cost of living. It is believed that these will be drawn from U.S. surplus resources. A further decree issued by the Cabinet declares the prices of foodstuffs to be frozen. Authorisation for rises may be given only by the Minister of Development.

Philippines plan canning industry

A pilot tomato canning plant is being established in the Philippines under the auspices of the Agricultural Credit and Co-operative Financing Administration. If this project is successful the canning of other local products will follow.

Fish meal and cannery plant

An investment of about U.S. $235,000 in a fish meal and cannery plant to be located in Valparaiso has been authorised by the Chilean Government. The plant will have its own fishing boats, freezing plant and motor vehicles and is to have a maximum capacity of 75 tons per day.

Japanese-Brazilian meal and oil factory

The Nissho Trading Co. of Osaka, Japan, is to set up a factory in Sao Paulo, Brazil, for the manufacture of farinaceous products and edible oils. This will involve an investment of Cr$50 million of which half will come from Japan, mainly in the form of equipment.

The other half will be subscribed locally. The factory is planned to start production in June 1958.

German dehydration plant

A new vegetable dehydration plant has been installed near Heidelberg in Western Germany, by Silva Werke G.m.b.H. Vegetables are dried evenly by hot air while spread out on a 660-ft. turbine-driven chain belt. At the moment the principal products of the new plant are sliced and granulated mushrooms, granulated, shredded and powdered horseradish and asparagus powder. Silva Werke are represented in the U. K. by L. I. Silber and Co., Ltd., who are also the importers of *Verdi*, *Perla* and *Lebelle* brands of tomato puree.

Irish butter goes to Germany

The Butter Marketing Committee in the Irish Republic recently received an order from Western Germany for 155 tons of unsalted freshly made butter. The price obtained was appreciably higher than the top prices obtainable in the British market. The committee has already exported three consignments totalling about 240 tons of salted butter to Western Germany this year.

Packaging

Icing sugar in tubes

John Dale, Ltd., are offering aluminium collapsible tubes with a star-shaped orifice. These are particularly useful for dispensing icing sugars, chocolate spreads, piping jellies, savour spreads, etc., straight from a collapsible tube to make shapes and designs to decorate cakes, biscuits, cocktail snacks and the like.

Hungary improving packaging

Hungary's Minister of Food, Mr. Imre Kovàcs, said in an interview with the newspaper *Népakarat* the Hungarian food industry was now giving more attention to attractive packing, which had thoughtlessly been neglected in the past on the grounds of economy.

Plastic packing, made from imported materials, was now being used for deep frozen products and preserves. In the near future they would make up one-meal packs of such things as pickles and fruit juices in PVC bags.

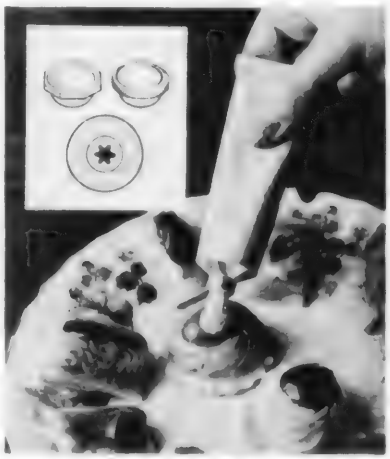
Insulated food containers

A series of insulated plywood cases has been introduced by Venesta, Ltd., which, they claim, enable food to be kept fresh during delivery without recourse to refrigerated vans.

Plywood is used for the exterior cases while the inner container varies according to the goods, *e.g.* a waxed sprayed plywood box for chilled meat products or a metal can for the carriage of dry ice. The insulating material between the inner and outer containers also varies but *Kapok* and *Onazote* (expanded ebonite) are most commonly used. A specific instance of the use of cases, is provided by W. L. Miller and Sons, Ltd., who use them to keep sausages fresh during delivery in roundsmen's vans.

Letchworth Bacon Co. Ltd.
1 lb Net
ENGLISH PORK SAUSAGES
Letchworth eights - eight to the lb
Letchworth eights - eight to the lb

The Letchworth Bacon Co.'s new pack for their chipolata and pork sausages. The sausages are wrapped in individual pounds in printed cellulose film and boxed in cartons each containing 6 lb.



Liquid icing sugar

Here the exterior cases are made of 4½ mm. birch plywood with riveted metal edge construction, and with a 1 in. *Onazote* liner stepped out at the corners and nailed up. This liner is sprayed with varnish to seal the edges.

Sweets for the I.G.Y.

The International Geophysical Year has been used to inspire the packaging of C. Kunzle's new *Fruit Crisps*. The moisture-proof film bag in which the sweets are packed is printed in two shades of blue to achieve a "celestial effect" and the bag has been printed with planets, stars, etc. The bags are sealed by *Cellotwist* and the flavour of the sweets denoted by a twin cameo embossed seal.

One dozen bags of sweets are contained in each display box. The box itself consists of a carton with a lid so creased that it can be folded over for display.

Transparent Paper Co., Ltd., made the film bags.

Irradiated polyethylene tape

Pilot plant quantities of polyethylene tape or film treated with high energy radiation are available from Tube Investments, Ltd. They claim that the tape has all the attributes of the polythene from which it is made and, in addition, is an excellent constructional and electrical raw material from which the chief limitations of polythene—breakdown at high temperature and environmental stress cracking—have been removed and additional advantages gained.

The tapes are claimed to have a complete absence of radioactivity, toxicity, migratory or extractable materials (non-antioxidant formulations). Suitable for use in heat-sealing, this material is said to be resistant to boiling water and to low pressure steam, impermeable to water and inert to acids and chemical reagents.

Among the applications for the tapes are the manufacture of sealed transparent envelopes for foods which may be cooked in the container and kept in sterile form for indefinite periods; making flavour-retaining wraps for foods during cooking and as release film in baking techniques which involve the use of heated tacky resins.

New Smedley packs. The cherry label has been re-designed to conform with a new basic design. The new 8 oz. can of sliced carrots is intended for picnics and one-person meals.

New Companies

Associated Gloucestershire Bakeries, Ltd. (587304.) 21, Great George Street, Bristol. £40,000. Subs.: R. T. Roberts and A. T. Stone.

Biedak's Frozen Foods, Ltd. (586697.) 31-2, Haymarket Court, London, S.W.1. £100. Dirs.: N. Diedak and Vivienne E. Biedak.

T. Bush (Billingsgate), Ltd. (586728.) Billingsgate Buildings, London, E.C.3. Fish and oyster merchants, etc. £100. Dirs.: J. Suett and Susanah P. Suett.

Chichester Meat Co., Ltd. (586685.) Stockbridge Road, Chichester. £10,000. Dirs.: C. P. Pearse, G. Hoare, L. T. S. Hawkins, S. B. Maxwell and D. G. E. Hoare.

Christie and Finlayson, Ltd. (586784.) 18, John Street, London, W.C.1. Growers, importers, dealers, manufacturers of and merchants of tea, coffee, etc. £200. Dirs.: L. R. Treen, T. H. Christie, A. R. King-Farlow and R. L. Finlayson.

Cooplands (Bacon Curers), Ltd. (586800.) 34, Hallgate, Doncaster. £3,000. Dirs.: Mrs. M. V. McIlroy, R. H. Jenkinson and D. M. Jenkinson.

Cooplands (Silver Street), Ltd. (586801.) 34, Hallgate, Doncaster. Bakers, confectioners, etc. £3,000. Dirs.: Mrs. M. V. McIlroy, R. H. Jenkinson and D. M. Jenkinson.

Cowper and Dodsworth (1957), Ltd. (587281.) 3, Condercum Road, Benwell, Newcastle-on-Tyne. Mfrs. of and dlrs. in chocolates, toffees, etc. £100. Dirs.: J. H. Cowper, S. Boyd and Mrs. G. M. Cowper.

Duncan, Gilbey and Matheson, Ltd. (587086.) Wine and spirit merchants, brokers, bottlers and warehousemen; brewers and maltsters, etc. £1,000. Dirs.: A. Duncan, M. N. Gilbey, I. M. A. and C. I. A. Matheson.

D. and E. Hancock, Ltd. (586785.) 23, Station Road, Port Talbot. Mfrs. of and dlrs. in confectionery, chocolates, sweets, etc. £1,000. Dirs.: Edith E. and D. L. Hancock.

Henbrooks, Ltd. (586828.) Bromley, Kent. Importers, buyers, sellers and merchants of meat. £1,000. Dirs.: J. A. Hennessy and L. J. Brooker.

C. A. Higgins and Co., Ltd. (587020.) 11, Cedar Square, Blackpool. Mfrs. of and dlrs. in confectionery, chocolates, sweets, ices, etc. £3,000. Dirs.: F., B., V. and L. S. Higgins.

Hotel Supplies (Bradford), Ltd. (587194.) 12, Tatler Chambers, Tatler Court, Thornton Road, Bradford. Nut packers and merchants. £3,000. Dirs.: J. and Mrs. H. Anderton.

K. Meisel and Co., Ltd. (587322.) Mfrs. of and dlrs. in prepared and cooked foods, etc. £5,000. Dirs.: K. Meisel, A. Kloza and W. J. Meisel.

Morisis Products, Ltd. (586967.) 15, Bridge Road, Wellington, Salop. Mfrs. of and dlrs. in and processors of ice cream, frozen and fresh foods, etc. £10,000. Dir.: G. Moruzzi.

Pre-Packs (Potatoes), Ltd. (586946.) 210, Fore Street, Edmonton, London, N.18. £100. Dirs.: J. J. McLellan and V. W. Bowles.

These particulars of new companies recently registered have been extracted from the daily register of Jordan and Sons, Ltd., Company Registration Agents, 116, Chancery Lane, London, W.C.2.

Technical Press Review

SEPTEMBER

Dairy Engineering.—Instrumentation of Milk Drying and Evaporating Plants; Dairying in South-East Asia—II; Collapsible Tubes for Dairy Products.

World Crops.—Review of the Potential and Development Possibilities of the South American Continent; Economic Species, Varities and Forms of Coffee; Food and Farming in Japan; The Deep-Litter System in the Tropics.

Manufacturing Chemist.—Pumps and Pumping; Review of Pumps for the Process Industries; Colgate's Operations in Manchester; Synthesis of 2-Deoxy-D-Ribose; Progress Reports: Fertilisers, Therapeutics, Detergents.

Paint Manufacture.—Formulating with Chlorinated Rubber; Modern Trends in the British Printing Inks Industry—II; Testing Furniture Finishes; Paint and Lacquer Additives—IV; Silicones in Protective Coatings; Storage Stability of Polyvinyl Acetate Emulsion Paints.

Automation Progress.—Automatic Assembly in the U.S.A.; Control of Quality in Automatic Production; Transfer Pressing; Report on Change and Control; Getting Information into a Computer; Analogue Digital Conversion; Modern Semi-Automatic Plating Shop.

Atomics.—Fuel Element Re-Processing; Power from Nuclear Fission; Niobium as a Nuclear Metal; A New Radiation Monitor; Dounreay's Fast Reactor; Television at Calder Hall; Cern Progress Report; Isotopes at Berkeley; Isotopes and Fertiliser Production; Engineering, Marine, Welding and Nuclear Energy Exhibition Report.

Chemical and Process Engineering.—Chemical Engineering in the Atomic Energy Industry; Contributions of Ion Exchange to Nuclear Technology; Adhesion and Adhesives.

Petroleum.—The Oil Geology of Australasia; The Yorktown Refinery; Synthesis of Liquid Fuels in China; Routine Inspection of Refinery Plant; Summer Meeting of the Institute of Petroleum; The Daura Refinery.

Building Materials. — Silicone Water Repellants for Masonry; News of Materials; International Digest; Vikon Metal Tile; Insulated Sandwich Walls; Porc-lin-ply.

For specimen copies write to Stratford House, Eden Street, London, N.W.1.

Trade Marks

AROMINT. — 761,129. Mint-flavoured chewing gum. **Wrigley Products, Ltd.,** East Lane, North Wembley, Middlesex.

CRAVENS FRUIT CRUSH.—762,131. Non-medicated fruit flavoured confectionery. **M. A. Craven and Son, Ltd.,** French Almond Works, Coppergate, York.

SAPERIA.—B760,298. Canned pineapple. **The Lee Pineapple Co., Ltd.,** Chulia Street, Singapore.

ORIENTAL DELIGHT.—761,009. All goods in Class 29. **B. N. Sexton and Co., Ltd.,** Plantation House, Eastcheap, London, E.C.3.

SAGITTA.—762,286. All goods in Class 29. **W. J. Peddie and Son,** Saxone Buildings, Tarleton Street, Liverpool, 1.

FLORINA.—750,020. Non-medicated confectionery. **Lindt (England), Ltd.,** Camomile Street, Bishopsgate, London, E.C.3.

PURITAN MAID.—753,829. Goods not including flour or flour goods. **Forte's and Co., Ltd.,** Café Royal, Regent Street, London, W.1.

QUEEN OF HEARTS.—755,961. Tarts. **W. J. Brookes and Sons, Ltd.,** Skerton Road, Old Trafford, Manchester, 16.

GOLD PLANET.—758,011. Tea. **Grocery Wholesalers (Norwich), Ltd.,** Millers Lane West, Norwich, Norfolk.

TWIN LIC.—759,708. Lollipops and toffee and caramel. **Fillery's Toffees, Ltd.,** Warwick Road, Greet, Birmingham, 11.

DULCET CHIMES.—760,356. Non-medicated boiled sugar confectionery. **Dulcet Confectionery, Ltd.,** North Acton Road, London, N.W.10.

FU-CO-ICE.—761,892. **John Thomas Briggs,** High Street, Holt, Norfolk.

BARBECUE.—751,401. Chocolates, toffees and non-medicated boiled sugar confectionery. **Mayfair Products, Ltd.,** Sunderland, Co. Durham.

WEIGHTS CIGARETTES.—B758,964. Non-medicated confectionery cigarettes. **Imperial Tobacco Co. (of Great Britain and Ireland), Ltd.,** Bedminster, Bristol.

HI-FI.—761,338. Chocolate, chocolates and non-medicated confectionery. **The Nestlé Co., Ltd.,** Hayes, Middlesex.

GOLDEN AMARAN.—755,532. Tea. **Price and Co. (Bakers), Ltd.,** Chaucer Road, Forest Gate, London, E.7.

FARMER JIM.—758,021. All goods in Class 29. **Waldens of Trowbridge, Ltd.,** The Down, Trowbridge, Wiltshire.

PALAM.—B760,761. Canned, spiced pork. **Brown and Knight, Ltd.,** Lower Marsh, Lambeth, London, S.E.1.

LUTKAMIX.—761,301. Food preparations consisting principally of potatoes in powder form. **Wingold Products, Ltd.,** Ashwell Road, Bethnal Green, London, E.3.

WATERGATE.—761,335. Edible oils and fats. **Triocean, Ltd.,** Borough High Street, London, S.E.1.

DAIRYMAN'S DAUGHTER.—761,351. All goods in Class 29. **Isle of Wight Creameries, Ltd.,** St. Thomas Square, Newport, Isle of Wight.

New patents are from the Journal of Patents and new trade marks are from the Trade Marks Journal. In each case permission to publish has been given by the Controller of Her Majesty's Stationery Office. Each of the publications is obtainable from the Patents Office, 25, Southampton Buildings, London, W.C.2.

Information and Advice

This Service is available to subscribers to FOOD MANUFACTURE. If a stamped addressed envelope is enclosed replies will be sent by post. Enquiries cannot be answered by telephone.

Sausage manufacture

B.8245. *Please supply information on the use of sulphur dioxide as a preservative in sausages, a recipe for rusk (as mentioned in* Sausage and Small Goods *by Frank Gerrard, published by Leonard Hill, Ltd.), and the use of polyphosphates with lean meat.* (Madrid, Spain)

Sulphur dioxide may be added in the form of sodium or potassium metabisulphite, or as anhydrous sodium sulphite. Sulphur dioxide may be added to the extent of 450 p.p.m. if this does not exceed the amount allowed by Spanish regulations.

About 4½ lb. of 80% acid calcium phosphate or acid sodium pyrophosphate and 3¼ lb. of sodium bicarbonate should be added to a 28 lb. sack of flour to make the rusk. It would be far simpler, however, to procure a proprietary brand of baking powder.

One of the most active constituents of proprietary polyphosphate mixtures is sodium pyrophosphate which may be used at a level of up to 0·5%. Besides assisting in the retention of water by the lean meat it is effective in promoting a good emulsification of the fat used in making the sausage mix and in preventing loss of fat when the sausages are cooked.

Jellied eels for bottling

B.8246. *Please let us have some information on the preparation of jellied eels for bottling.* (Colchester, Essex)

We suggest the following method of preparing jellied eels which may be used as a basis for trial.

Skin the eels, remove their heads and tails, and wash in salted water. Cut into pieces about 2 in. long and put into a stewpan with a bay leaf, parsley, sage and a shallot, a wineglassful of white wine, half the quantity of vinegar and a small quantity of water. Season with salt and pepper, put on the lid and cook gently until tender. Remove from the heat and leave in the pan until quite cold, keeping them covered. Put the pieces of eel round the sides of a mould with the ends towards the centre, cover with jelly and place mould in a cool place.

The white wine may be omitted.

The jelly may consist of a solution of gelatine, but it can best be made from the bones, fins and heads of any white fish, a small quantity of salt, mace and pepper, 1% agar (or 5-10% gelatine) and bouquet garni. The bones, fins and heads are covered, the seasoning added and the whole allowed to simmer until all the goodness is extracted. The liquor is skimmed and strained through muslin.

Dextrose in biscuits

B.8249. *Can you give us some recipes for manufacturing biscuits sweetened with dextrose?* (Anvers, Belgium)

Dextrose in a biscuit produces certain effects such as greater spread or flow in the oven and a darker crust colour. In relation to sugar or sucrose, it is about three-quarters as sweet, weight for weight. The product in which it is used will probably absorb moisture more readily. These effects may or may not be desired.

Dextrose is present in honey or invert sugar to the extent of about 35% and it is present in corn sugar to the extent of about 87%. In a recipe, therefore, that calls for the use of these materials you could include dextrose in the equivalent amounts, and as an example we give below a recipe taken from the book *Biscuit and Cracker Production* by Ralph M. Bohn.

Flour	200 lb.
Corn sugar	20 ,,
Sugar	35 ,,
Invert syrup	20 ,,
Shortening	55 ,,
Salt	3 ,,
Nonfat dry milk	4 ,,
Soda	2 ,,
Vanilla flavour	as desired
Ammonium bicarbonate	1 lb.
Water (variable)	15 ,,

In view of the effect which dextrose has on a biscuit dough, if your aim is to substitute dextrose for sucrose or ordinary sugar you should carry out experiments replacing part of the sugar in your recipes with dextrose to see at what level the substitution can be made satisfactorily.

Information supplied

The Enquiry Service has dealt with requests for names of manufacturers and suppliers of plant, machinery and materials, and also general information as follows:

B.8163. *Suppliers of flavouring enzymes.* (Goteborg, Sweden)

B.8165. *Recipe for biscuit containing malt.* (Hyde, Cheshire)

B.8166. *Suggestions for disposal of 4-gal. tin drums.* (Isle of Ely)

B.8167. *Address of overall-hire laundry service.* (Coventry)

B.8168. *Manufacturers of metal boxes for shortbread.* (Lichfield, Staffs.)

B.8169. *Uses of sodium propionate in food.* (London, S.E.1)

B.8170. *Suppliers of cocktail biscuits for export.* (Liverpool)

B.8171. *Manufacture of fruit syrups.* (Toronto, Canada)

B.8172. *Manufacturers of flavouring enzyme.* (Molento, S. Africa)

B.8173. *Recipe for chocolate couverture.* (Altrincham, Cheshire)

B.8174. *Suppliers of clips for polythene bags.* (Trowbridge, Wilts.)

B.8175. *Storage of tomatoes.* (Guernsey, C.I.)

B.8176. *Manufacture of dehydrated onions.* (Hawthorne, Victoria)

Recent Patents

COMPLETE SPECIFICATIONS ACCEPTED

782,651 and 782,652. K. HEINRICH: Sugar beet extractor.
782,832. QUAKER OATS, LTD.: Cereal products and their manufacture
782,580. L. C. SNELLING (LONDON), LTD.: Bottling machines.
782,848. J. AND E. HALL, LTD.: Storage of fruit.
782,857. J. R. MCCONNELL: Apparatus for use in cleaning eggs.
782,869. GENERAL FOODS CORPORATION: Baking powder compositions.
783,271. J. STOTT AND CO. (ENGINEERS), LTD.: Beverage preparing apparatus.
783,090. ROSE BROS. (GAINSBOROUGH), LTD.: Application of labels to containers.
782,896. W. AND T. AVERY, LTD.: Automatic weighing apparatus.
783,194. MONSANTO CHEMICALS, LTD.: Preservation of fruit.
782,940. CANADA PACKERS, LTD.: Process for rendering animal fats.
783,226. MEYER MALT AND GRAIN CORPN.: Malting apparatus.
782,964. COMPAGNIE GENERALE DE GRANDE PECHE: Cold storage installations notably for the preservation of fish.
783,230. FIZZMASTER CORPN.: Device for carbonating beverages.
783,242. E. COCCHI: Safety closure for bottles, etc.
781,294. J. AND C. HALL: Machine for washing containers such as milk bottles.
781,399. FOOD MACHINERY AND CHEMICAL CORPORATION: Fruit preparation machine.
781,568. BRITISH CANNERS, LTD.: Preservation of fruit or vegetables.
781,584. BRITISH VINEGARS, LTD.: Manufacture of vinegar.
777,890. L. AND I. NATERMAN: Bottle capping apparatus.

ABSTRACTS OF BRITISH PATENTS

Sandwich-making machine

A sandwich-making machine for making sandwich-type biscuits, cakes, confections, etc., comprises a movable conveyor capable of receiving sandwich elements arranged in at least two rows extending in the direction of movement of the conveyor; a depositing device arranged and adapted to deposit sandwich filling on each of the sandwich elements of the first of two adjacent rows on the conveyor; and means arranged above the conveyor for engagement with the sandwich elements of the second row so that each is inverted, laterally displaced and superimposed on a corresponding sandwich element of the first row on which a filling has been deposited. In this way alternate sandwich elements in a transverse row across the conveyor are inverted, and placed respectively on the remaining sandwich elements in the row. The term "sandwich element" means the cake or biscuit forming the upper or lower part of the completed sandwich.

The inverting device may be so related to the remainder of the machine that only one magazine is required for supplying cakes to the conveyor. In this way, the problems of maintaining the magazines filled with cakes, etc., are decreased and skipping of cakes and the disadvantages of smearing of the conveyor and the machine with filling are substantially eliminated, whereby higher production rates and a better or more sanitary product are obtained.

The machine is intended to replace the normal sandwich-making machine in which two magazines are spaced lengthwise of a conveyor.—779,541. *E. T. Oakes Corpn.*

Canning green vegetables

Dilute aqueous solutions of chlorophyllin (using the term as a description for all water-soluble chlorophyll derivatives) can be used in the canning of green vegetables, especially peas, to impart or preserve their colour. However, their efficacy is impaired because of the fading of the colour of the solution, particularly during cooking; the solutions fade in colour more rapidly in the light than in the dark and very rapidly when heated.

Fading is considerably reduced if the solutions contain a neutral salt of *l*-ascorbic acid (vitamin C) or ascorbic acid salt. The colour of canned greened peas, etc., is better preserved during cooking and also, it is believed, during subsequent storage. A dry mixture of chlorophyllin and ascorbic acid salt is also suitable when dissolved in water for carrying out the process.

As an example, a canning liquor for peas is made up as follows, other ingredients being included if desired:

Sodium chlorophyllin, 100% N.N.R. assay	1·0 g.
Ascorbic acid	0·5 g.
Sodium bicarbonate ..	0·25 g.
Distilled water	to 5 litre

Dissolve the sodium bicarbonate and then the ascorbic acid in part of the water. Dissolve the sodium chlorophyllin in a further part of the water. Mix the solutions and dilute to the final volume with distilled water. Adjust the *p*H of this solution as required, by the addition of 1% w/w hydrochloric acid (q.s.). The *p*H is not very critical over the range of 5 to 9 but the most satisfactory results are obtained at *p*H 7 to 8.

Solutions can be made at any required concentration up to 20% w/v, though solutions at higher concentrations than 1% w/v must be at *p*H over 8. Other water-soluble chlorophyllins may be used and instead of producing the sodium derivative of ascorbic acid in solution, one can employ an appropriate amount of the dry sodium salt of ascorbic acid and dissolve this in water, or mix it with dry chlorophyllin to produce a preparation to be dissolved in water as and when required. However, in all cases the weight of sodium ascorbate should be not less than half that of the chlorophyllin used to secure the best results.—779,560. *The Allen Chlorophyll Co., Ltd.*

Salt crystallisation

A process of manufacturing common salt of low bulk density consists of evaporating in the absence of air a brine substantially freed from calcium and magnesium salts, to which has been added a small proportion of an alkylene diamino tetra acetic acid, or a substitution product, salt or ester of such an acid, or a metal complex of any of these substances.

The purpose of these substances is to avoid prohibitive furring of the evaporator when evaporating brine in the absence of air and under reduced pressure.

A modification of the process consists in adding to brine substantially freed from calcium and magnesium salts about 0·5% by weight of unpurified brine containing 10% by weight of the latter of a 15% by weight aqueous solution of ethylene diamine tetracetic acid or its sodium salt.—779,742. *Palmer, Mann and Co., Ltd.*

Dough mixing machine

In a machine for continuously preparing dough for bread and other baked pastry products by kneading flour and water, together with the conventional additives, the water is evenly distributed among, and caused to penetrate into, the particles of flour to form a dough which leaves the kneading machine after less than one minute so that no gluten network is formed and the baker's yeast does not have time to become effective. The quantity of water which may be added to the dough is also greater than that which can be added to the normal batch process using the same type of flour to obtain the same consistency after the appropriate rest period.

The machine consists of inlet means for the flour, water and additives, a mixing device for these materials and an expellor for the dough. The machine should be so constructed that there are no dough residues remaining in the machine to set off uncontrolled fermentation.

After a standing time of only two minutes as opposed to the normal period of up to 45 min., the dough may be processed in the usual manner.

For a continuous operation the machine should be adjusted so that the measured materials are fed in continuously by a preliminary kneading device and that the dough is served out by the discharge device at a uniform rate.

Loaves produced by this method are claimed to have a more constant taste, a more uniform weight, larger volume and to keep fresh for a longer period of time as compared with those made according to the known methods.

Higher output and a saving in labour are also claimed for this method.—777,251. *H. Strahmann.*

Abstracted from the Official Journal of Patents and from published specifications. These publications are available from the Patents Office, 25, Southampton Buildings, London, W.C.2.

Wood engraving by John Farleigh

The Treasure of Belerion

A COLUMBUS OF HIS TIME, Pytheas of Massalia, Greek merchant mariner of three centuries B.C., sailed into the unknown beyond the Pillars of Hercules. These sentinel pillars of Gibraltar were the edge of the world to the Greeks, who saw them as the gateway to destruction. Undaunted, Pytheas sought an easier way than arduous overland portage to bring home the tin and amber of the North. He sailed on and came at length to a land of woad-painted men—to Belerion and its fabled tin mines. And so a new trade route for Cornish tin was opened.

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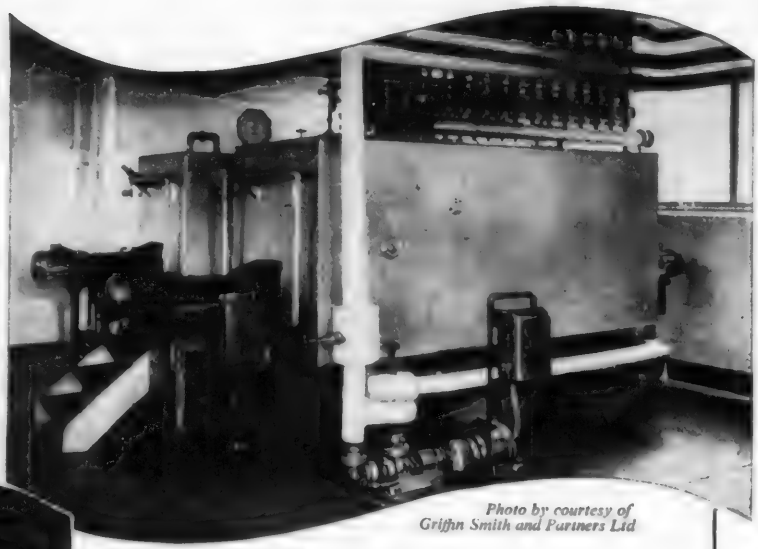

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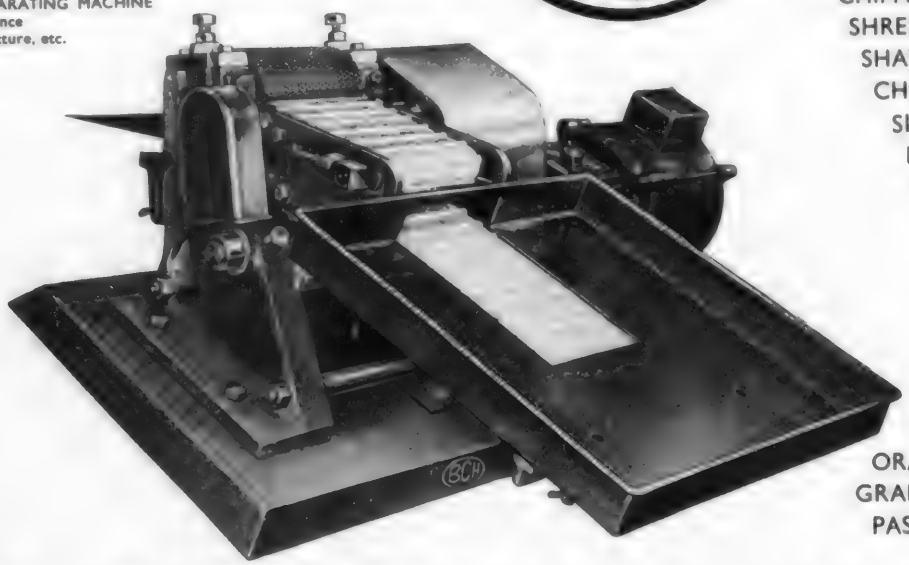

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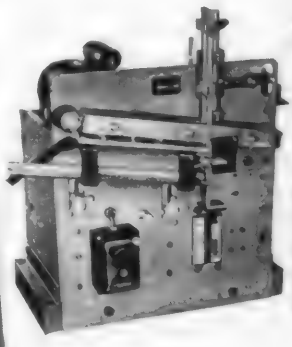

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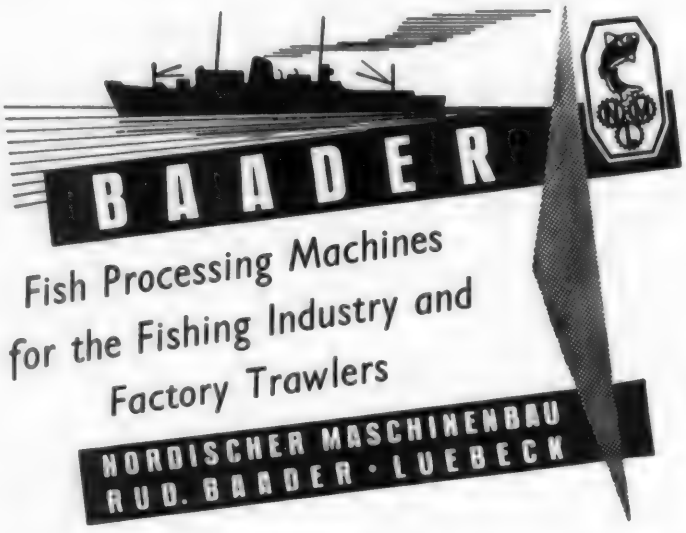

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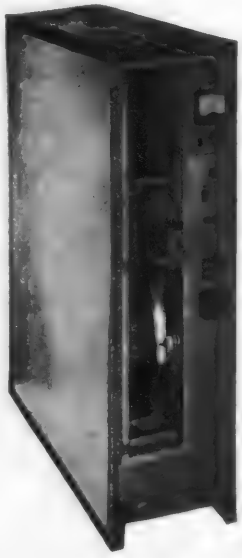

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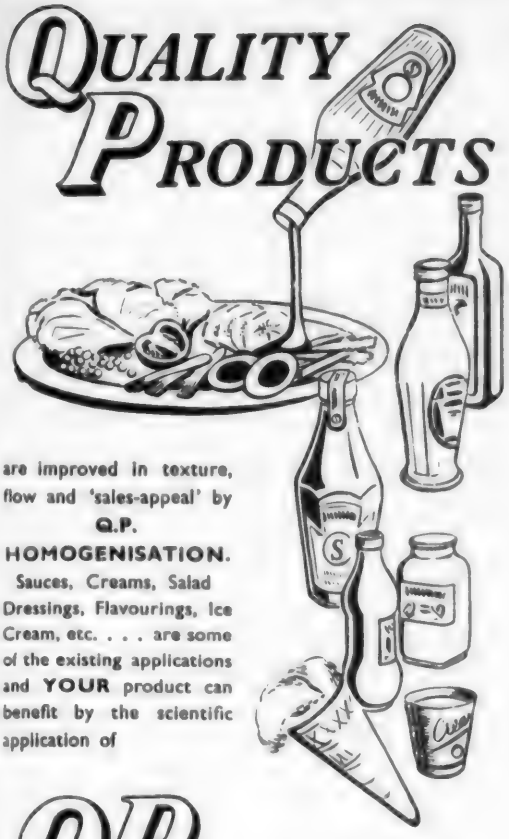

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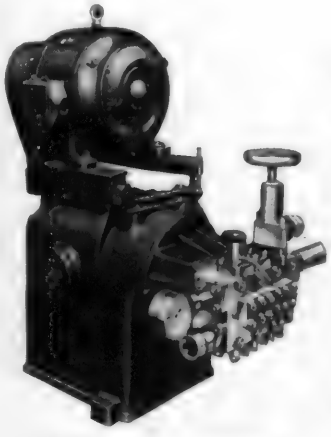

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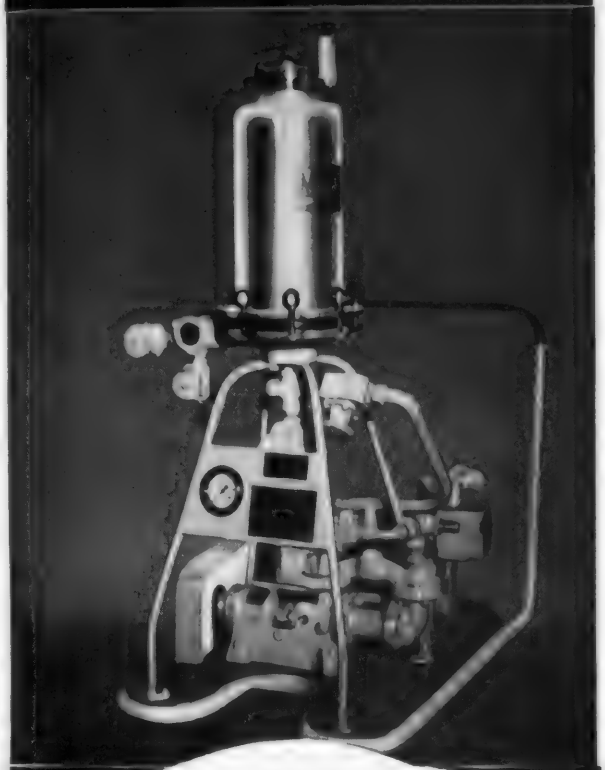

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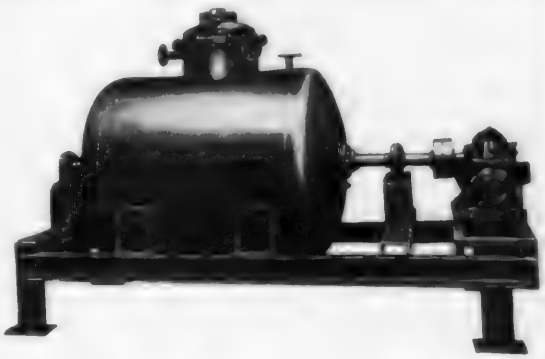

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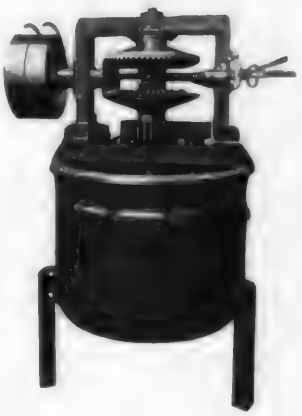

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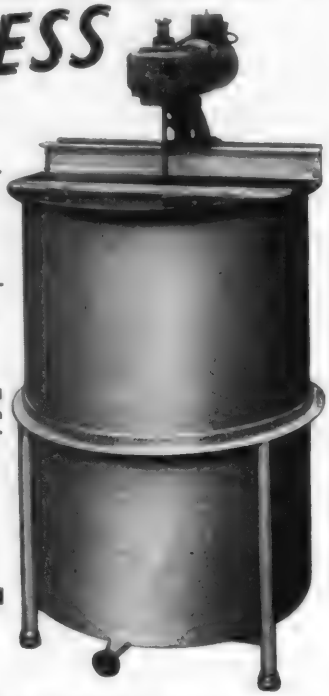

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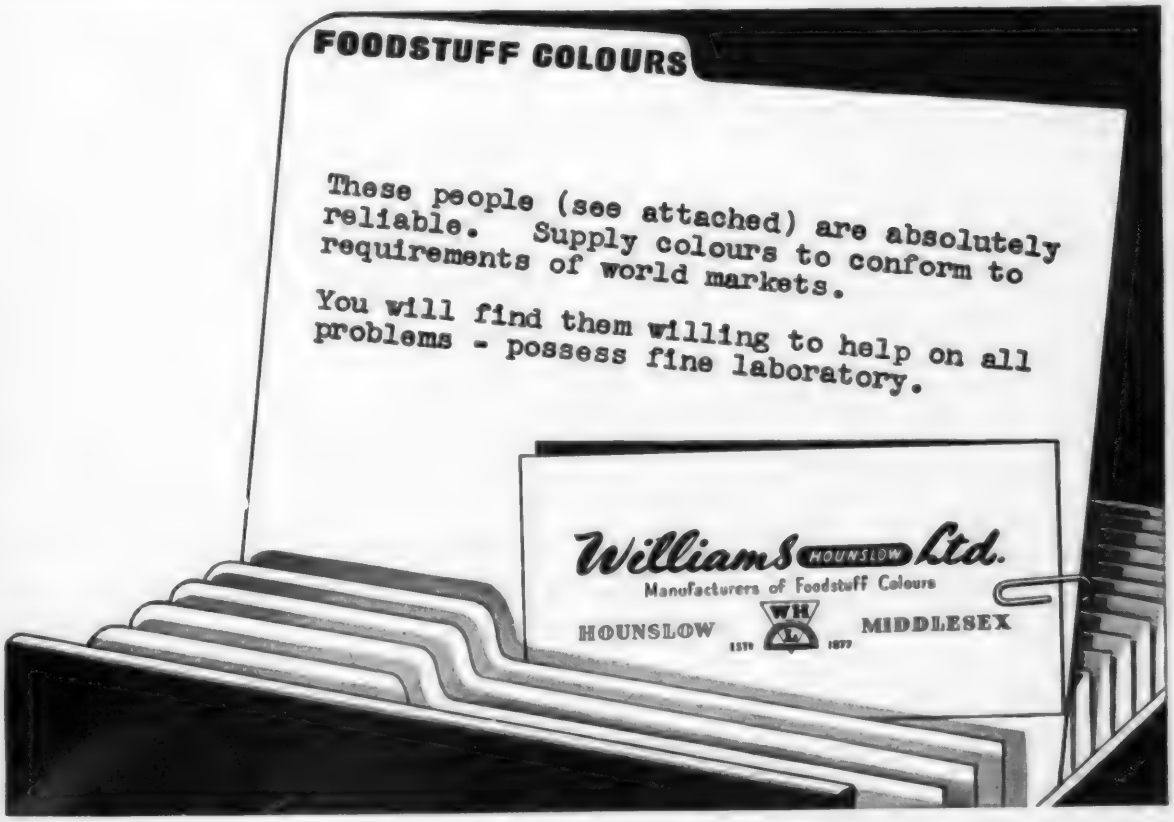
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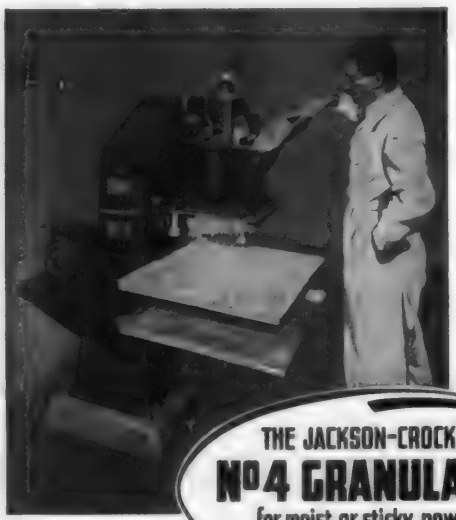

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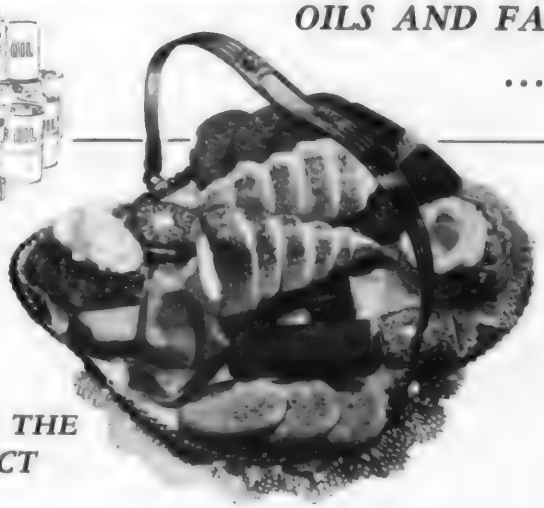

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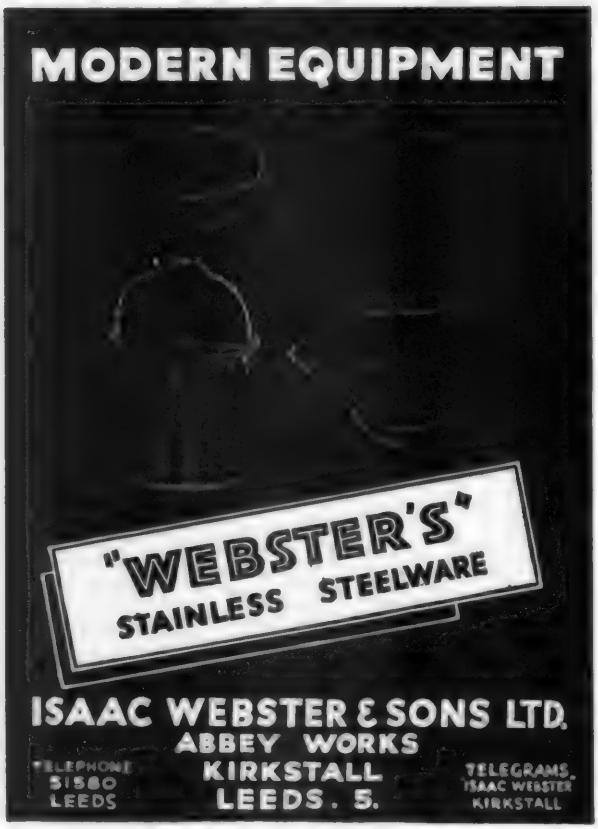

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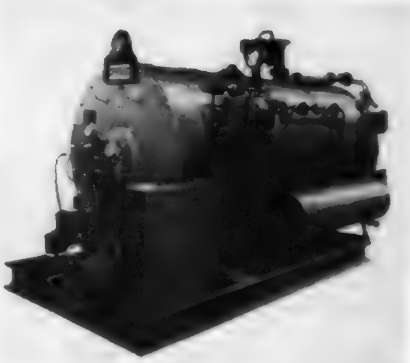

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STAINLESS steel Vats or Pots required. Sizes 25 to 250 gal.—Denton Edwards Paints Ltd., Abbey Road, Barking, Essex.

SURPLUS Confectionery Machinery purchased by organisation with overseas contacts Starch plant, batch rollers, crystallising machines particularly wanted. Anything considered. Prompt settlement and collection. —Box B5575.

STAINLESS steel Milk Storage Tanks and A.P.V. or similar type Pasteurising plant.—Full particulars, price and availability for inspection to M.C.D. Ltd., Corporation Street, Birmingham, 4.

WANTED: Rotary Drum Dryer in good condition, suitable for drying bread crumbs, with an approximate capacity of 2½ to 4 cwt. per hour. Please give full particulars and price required.—Box B5583.

SOUTHALL and Smith Weighing Machine, from 1 oz. to 3 lb. £20 to £40, according to condition.—Apply 61, Weston Lane, Greet, Birmingham, 11.

REQUIRED. A vertical steam Boiler. Working pressure 80-100 lb. Evaporation 2,500 lb. Must be in very good condition. Also Food Processing Machinery, including Retorts, Exhausters, etc.—Please send full details to Secretary, U.A.O.S., 16, Donegall Square South, Belfast.

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PLANT FOR SALE

SURPLUS CANNING PLANT FOR SALE. *All the plant and machinery illustrated on page ix and described here is in first-class condition and can be seen in the W.1 area. Item 4:* **Spherical Copper Steam Jacketed** 40 lb. w.p. **Mixing Pan.** 3 ft. 6 in. diam. Feed aperture 2 ft. diam. Belt driven. *Item 5:* **Labelling Machine in case. Standard Knapp.** *Item 7:* **Stainless Steel Boiling Pan** by Brierley Collier and Hartley, Rochdale, with c.i. jacket. On tubular legs. 60 lb. s.w.p. *Item 18:* **Motor Driven Caser for No. 1 can size.** *Item 19:* **"BETH" Labelling Machine** motor-driven through variable speed gear. *Item 20:* **Filled Can Elevator.** *Item 21:* 5 ft. by 2 ft. 6 in. **Mesh Belt and Disc-type Can Unscrambler.** Motor and reduction gear driven. *Item 22:* **9-D8 Double Seamer.** Fully automatic. Fitted for No. 1 cans with change parts for A-2½, A-2, A-1 tall and 300 by 208 (8 oz. cans). (Machine is complete but photographs show it unassembled.) *Item 23:* **16-Head Stainless-steel Rotary Filling Machine** by Cherry-Burrell Corp. Belt driven. (Machine is complete but photograph shows it unassembled.) *Item 24:* **Max-Ams 168C Motorised Double Seamer** Semi-automatic. *Item 25:* **Can Body Reformers** by Metal Box Co. Motorised. *Item 26:* **Horisontal Power Flanger,** type F.M.B. Automatic Belt-driven from motor. *Item 35:* Metal Box Co. **Hand Can Flange Rectifiers.** *Item 27:* **Hand Flanger** by Metal Box Co. *Item 28:* 14 ft. motorised **Vertical Empty Can Elevator.** Adjustable Can Runway. Approx. 30 ft. Runway Empty Can Steriliser. Adjustable. *Item 29:* M.B.1 **Hand Seamer.** *Item 30:* **60-gal. Stainless Steel Jacketed Boiling Pan** fitted stainless steel cover. *Item 31:* **Stainless Steel Tr-clover Sanitary Pump** for 1½ in. stainless steel fittings. *Item 32:* 3 ft. 6 in. by 3 ft. 6 in. by 1 ft. 6 in. **Glass-lined Cast Iron Storage Tanks.** Overall height 2 ft. 2 in. 1 in. i/d outlets. Capacity: 100 gal. *Item 33:* 14 ft. by 4 in. **Tube Stainless Steel Flash Pasteuriser** fitted with Pump and Steam Temperature Controller. *Item 39:* **Hand Operated Sausage Filling Machine,** 15 lb. capacity. *Item 40:* **Rotary Bowl Chopper** by Silent Mach. Co. Ltd. *Item 41:* **Conveyor 15 ft. by 12 in.** *Item 42:* **Enterprise No. 41 Meat Mincer.** Belt driven. *Item 43:* **Pineapple Grater** by Zastrow-Mitchell. Belt driven *Item 44:* (Crated) **60-gal. Stainless Steel Jacketed Steam Boiling Pan** fitted stainless steel cover. Unused. *Item 59:* Waukesha **Stainless Steel Pump** size 25, 1½ in. inlet and outlet. *Item 65:* **Standard Platform Computing Scales.** 1½ lb. by ¼ oz. *Item 66:* Scales as above (unused in case). *Item 67:* Fairbanks Platform Scales. 1,000 lb. cap. *Item 68:* Vandome-Hart 4 lb. Platform Scales. Type 267. *Item 69:* Extract Weight Scales. 1 lb. *Item 78:* Rodney Automatic Paper Tape Sealing Machines by Saml. Jones and Co. *Item 79:* Rodney Automatic Paper Tape Sealing Machine by Saml. Jones and Co. (unused in carton). *Item 80:* ¼ in. Steel Strapping Machines by Seamless Strapping Co. *Item 81:* Stands for Strapping Reels. Offers invited for all or any of the above equipment by London Agency, **Bahama Food Products Ltd., 82-90, Seymour Place, London, W.1.** Tel.: PADdington 3456 (10 lines).

FOUR Vickers Armstrongs "Empire" Box Stitching Machines, pedestal mounted with automatic wire feed and self-contained motor drive. First class condition.—Details from Box B5587.

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FOR sale Kellie Fruit Filterpress, Sugar or Juice Filterpress, Air Compressor, stainless steel Tilting Fruit or Peel Cooker, 60 gal. B.C.H. Rotary Jam Cooler A.P.V., 40 gal. B.C.H. Tilting Jam Pan, 100-lb. pressure.—Box B5589.

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600

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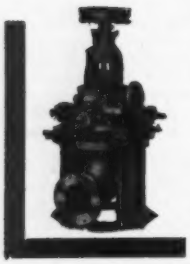

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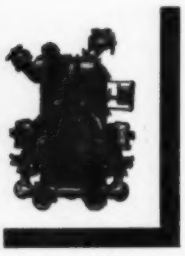

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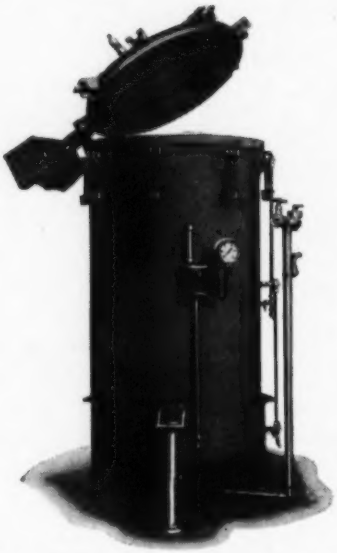

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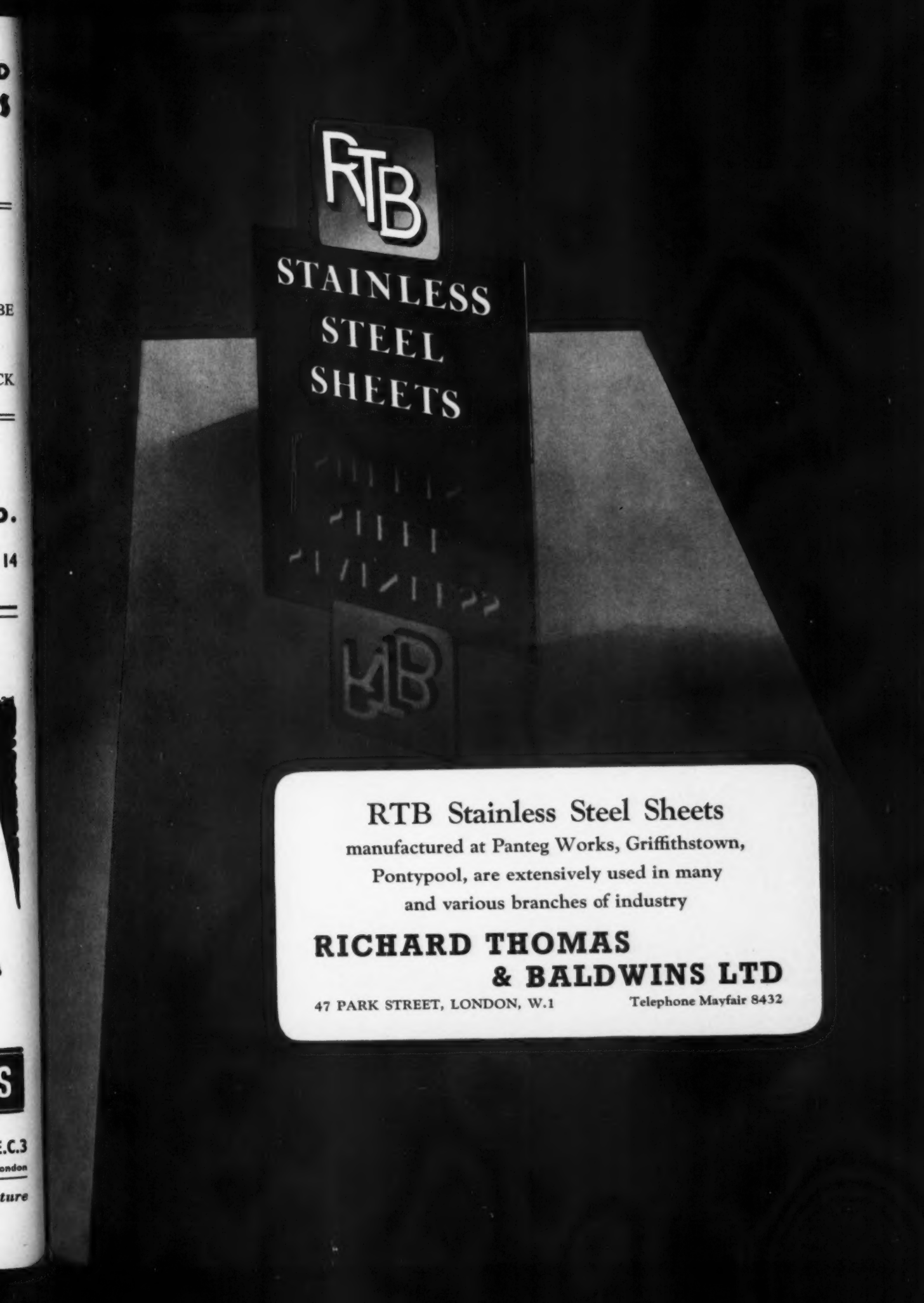
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